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VIEWS, NEWS AND INTERVIEWS.

A press dispatch from St. Paul states that the Pillsbury-Washburn Flour Mills Company has placed a contract for a new electric plant to cost $300,000.

The Prince of Wales recently opened the Davy-Faraday Research Laboratories, in London, presented to the Royal Institution by Dr. Ludwig Mond. This munificent gift consists of the large house in Albemarle street, adjoining the Royal Institution, which Dr. Mond has completely equipped as a research laboratory, fitting it with the most modern improvements in the way of instruments and appliances for research in chemistry. Dr. Mond has also placed to the credit of the Royal Institution a very handsome endowment. In formally presenting his noble gift to the Royal Institution, Dr. Mond made a most interesting speech, in which he explained the details of the inception of this scheme and stated that he had named the laboratories the Davy-Faraday Research Laboratories in perpetual memory of those two great pioneers, who carried out their researches almost on the very spot where the new laboratory stands. According to *The Lancet*, the present professors of physics and of chemistry at the Royal Institution, Lord Rayleigh and Professor Dewar, have undertaken the important duties of directing the work of the new research laboratories without remuneration, a fact which, while it redounds infinitely to their credit, should stimulate further munificence in the direction of endowment. After the opening ceremony, Professor Dewar exhibited a number of interesting experiments, illustrating the uses of liquefied air in scientific research. He liquefied some of the air of the theater, an experiment which excited the greatest interest among the audience.

"Philip," said Mr. Gratebar, "don't fret. A great part of modern scientific endeavor is devoted to the overcoming of friction with its consequent loss of power. What a pity, then, for men to waste their own strength in worse than useless fret'ing! Philip, don't fret!"—*New York Sun.*

A press dispatch from Milwaukee states that Mr. W. N. Cromwell, who has recently been in Milwaukee on account of the four-cent-fare litigation, caused a good deal of surprise by his statement that the Milwaukee Electric Light and Railway Company had not been earning running expenses during the past 11 months. Mr. Cromwell assured the court that the New York investors had provided Milwaukee with the finest trolley system in America, and that they had never received a cent in dividends. He added that to enforce the four-cent-fare ordinance would mean bankruptcy. The company lost a good deal of money by reason of the strike of last Summer, but the general impression has been that it was earning expenses, an impression which was strengthened when the company recently bought out the power and lighting business of Pabst, the brewer. It is believed that the connection formed with the new interurban line, which is ultimately to extend to Chicago, will be a good thing for the company, especially in Summer. The line is now in regular operation between Milwaukee and Racine.

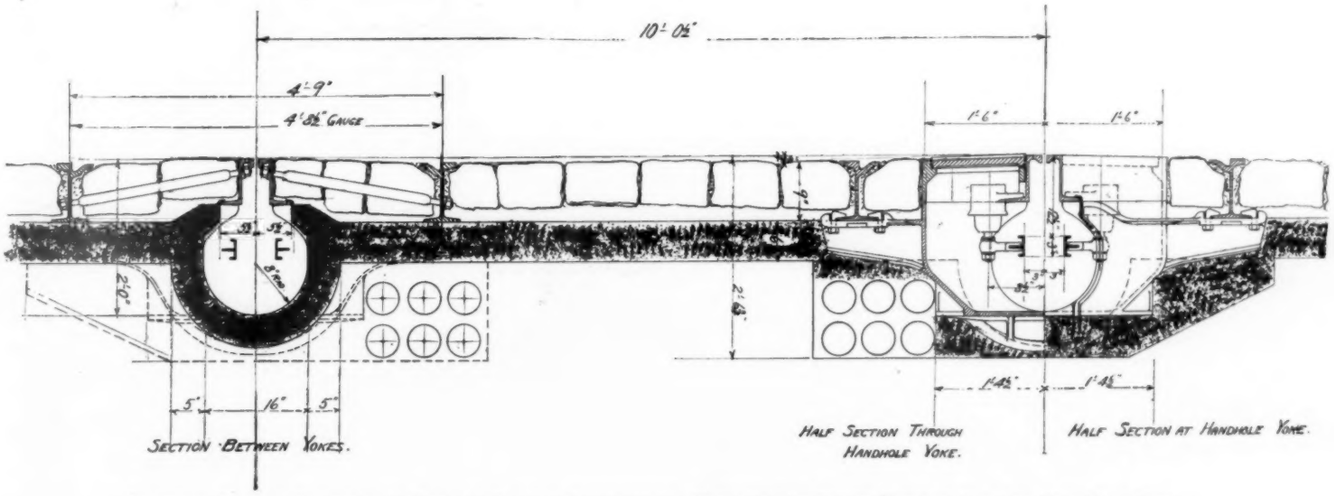
The electric railway between Buffalo and Niagara Falls achieved notoriety last week from the fact that a man was robbed of a satchel containing a large sum of money while riding on one of its cars. The thief was found, but the satchel was not. Trolley "hold-ups" seem to be popular.

THE UNDERGROUND TROLLEY IN NEW YORK CITY.

PLANS OF THE METROPOLITAN STREET RAILWAY COMPANY FOR THEIR NEW ELECTRICAL EQUIPMENT.

For many years New York city has enjoyed the distinction of being the metropolis of the United States and the one large city in America where electric rapid transit facilities were almost unknown. Two or three years ago the old "Huckleberry" horse-car line changed over to the trolley, and, by some pretty quick and sharp work, succeeded in installing an overhead trolley line on 135th street. Then the Lenox avenue underground trolley road was built from 109th street and Columbus avenue to 146th street and Lenox avenue, where stands the only electric power-house operated by the Metropolitan Street Railway Company. At the present time the two roads mentioned are the only street railways on Manhattan Island operated by electricity.

But all this is to be changed. The Metropolitan Street Railway Company has just completed very comprehensive plans for the introduction of a modern type of underground trolley construction on the Fourth, Sixth,



SECTIONAL VIEW OF UNDERGROUND TROLLEY RAILWAY CONSTRUCTION, METROPOLITAN STREET RAILWAY COMPANY, NEW YORK CITY.

and Eighth avenue lines now operated by horses. These plans also include the building of two large generating stations.

Just as soon as the weather will permit, work will be begun and pushed to completion as rapidly as possible.

As will be noted from the very comprehensive drawing on the preceding page, the type of construction is similar to that used on the Lenox avenue underground line, with the exception that the U form of the yokes is shortened, making a less expensive form of construction.

The Lenox avenue line was installed with the view that, should the underground trolley system prove a failure, cable traction could be substituted at very little expense; consequently the Lenox avenue line was built on the same plan as the Broadway cable road. The Metropolitan Street Railway Company is, however, so well satisfied with the performance of the underground trolley that its new plans call for a radius of but eight inches in the hollow of the yoke, as shown in the drawing.

Another slight change is made in the form of the iron conductor, which, instead of being of regular channel iron, has more of a T shape. The track rails will not be bonded at all, the two iron conductors forming a complete metallic return system and avoiding any danger of electrolysis. The iron conductors will be bonded at the joints.

The insulating supports will be of porcelain, and it is believed that the leakage of the line will be reduced to a minimum.

No contracts have yet been awarded for the construction work, although it is believed that a well known New York firm will secure the job. Contracts for the track and switch rails have been awarded, as already mentioned in the ELECTRICAL REVIEW. Other contracts for various parts of the equipment required are being closed almost daily. It is understood that the General Electric Company has received an order for seven large generators to be installed in the two new power-houses.

The Atlantic Avenue Commission, of Brooklyn, N. Y., has offered to Mayor Wurster a comprehensive rapid transit plan for the Greater New York. It includes the tunneling of the East River and the running of fast trains by electricity between New York city and Jamaica, L. I. It is well that electricity is mentioned as the motive power even at this early stage.

A New Trolley Road in New York City.

The Third Avenue Railroad Company have signed contracts for the construction of an overhead trolley road, an extension of their present lines, from 165th street and Amsterdam avenue to Kingsbridge, in the northern part of New York city. The line will run from the junction of Kingsbridge road and Amsterdam avenue, at 165th street, via the Kingsbridge road, to Spuyten Duyvil Creek, a distance of about two and one-half miles.

Iron center pole constuction will be used and every alternate pole will carry a 2,000-candle-power arc light. The power-house will be situated on the banks of the Spuyten Duyvil Canal at 214th street. There will be 15 boilers, aggregating 2,500 horse-power. These will be of the water-tube type. The engines will be three in number, of 1,100, 700 and 500 horse-power, respectively. There will be three dynamos directly connected to the engines, and of similar horse-power capacity.

The power-house is also provided with two 125-arc-light Brush dynamos, which will supply the electric lights along the line by a separate system of wires. Work has already been begun on the power-house, and the Third Avenue Railroad Company expects to have everything completed and in working order by next Summer. The estimated cost of the power-house alone is $100,000. The entire cost of electrical equipment will be $250,000.

The "Espersen" Shade Lamps.

A particularly practical and ornamental series of shade lamps for home and office use, in connection with the incandescent circuit, have recently been patented and are now being introduced by the Pacific Electric Company, of La Crosse, Wis.

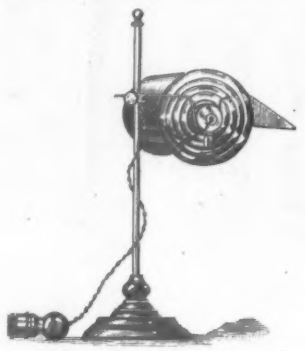


FIG. 1.—ESPERSEN SHADE LAMP WITH SLIDING STANDARD.

Illustration Fig. 1 shows the adjustable form of the "Espersen." The light can be adjusted to any height on the standard and placed at any angle. It is the student's lamp of electricity, and jewelers, watchmakers, opticians and others who use a light near the work will find it a marvelous arrangement. Fig. 2 shows the "swinging arm lamp." This lamp has three independent movements, and is claimed to be the best adjustable lamp on the market. For upright pianos or roll-top desks the lamp illustrated in Fig. 3 is designed so that it can be fitted to any desk.

The library lamp, with Espersen adjustable shade, is a very handsome parlor ornament. The Cupid, in silver finish, holds the lamp in such a position that it casts a brilliant light and permits the shade to be free and adjustable. The design is from an artistic model, and is just the thing for a library or where a stylish lamp is desired.

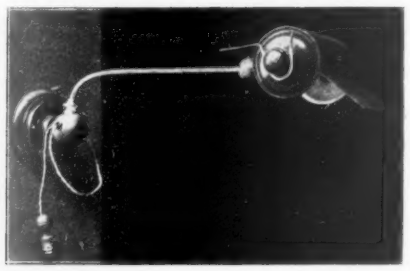


FIG. 2.—ESPERSEN SWINGING-ARM SHADE LAMP.

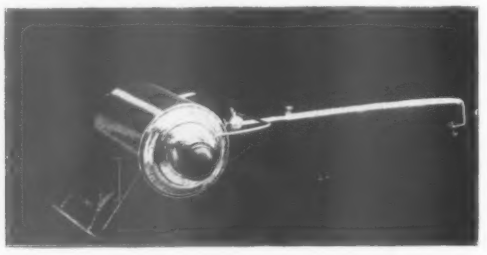


FIG. 3.—ESPERSEN SHADE LAMP WITH DESK ATTACHMENT.

FIG. 4.—ESPERSEN LIBRARY SHADE LAMP.

ITEMS OF INTEREST.

Germany and Spain are now connected by a submarine cable 1,250 miles long, the ends of which are at Emden and Vigo. It is the first link in a series of lines to be first extended to Brazil and to the United States by way of the Azores.

A movement is on foot at Menominee, Mich., to develop the water power at Chappee Rapids. The plan in contemplation involves the building of a $30,000 dam across the Menominee River, six miles above the city. A fall of 40 feet can be obtained.

Mr. John G. Flournoy, of Columbus, Ga., has organized the Brush Electric Light and Power Company. The company, it is reported, proposes to invest $500,000 in its plant for the development of electric power from the falls of the Chattahoochee. Already 1,200 horse-power has been developed, and this will be raised to 2,000 horse-power. The power now obtained from the falls, about one mile from the center of the city, is used to run street cars, to supply electric arc lights, to furnish power for two clothing factories and several smaller industries. The company will soon be prepared to supply also all the incandescent lights that will be needed in Columbus.

The Electric Power Company, of New York city, had an action before Justice McLaughlin, of the Supreme Court, last week to recover $250,000 damages from the city for the summary removal of its wires and poles under an order made by Mayor Gilroy in 1889. The company claimed that it had $300,000 invested in its business under power given to the company to use wires under or over ground, and that the vested rights for overground wires thus secured could not be taken away without compensation to the company. The company then had but one important competitor, the Edison company, and was doing an immense business, which, with the increase of the use of electricity since that time, would have been augmented many times over. The action of the city has broken up its business.

Roentgen Rays and Tuberculosis.

An exchange says that tuberculous afflictions of the lungs can now be detected by the Roentgen rays, according to M. Bouchard's report to the Académie des Sciences. The revelations of the fluoroscope have been confirmed by auscultation in cases where the disease was just beginning and where the expectorations showed no bacilli, and other physical signs would have left the physician in doubt.

INTERVIEW WITH MR. EDWARD H. JOHNSON.

THE PRESIDENT OF THE INTERIOR CONDUIT AND INSULATION COMPANY TALKS FREELY OF ELECTRICAL MATTERS IN EUROPE—RECENTLY RETURNED AFTER A SIX MONTHS' ABSENCE — THE JOHNSON – LUNDELL CONTACT SYSTEM FOR ELECTRIC RAILWAYS ADOPTED IN ENGLAND, AND THE PATENTS SOLD FOR EUROPE — APPRECIATION OF AMERICAN INVENTIONS.

A representative of the ELECTRICAL REVIEW called on Mr. Edward H. Johnson, president of the Interior Conduit and Insulation Company, last week with a view to learning why he had deserted these United States for the past six months. In response to the inquiry, Mr. Johnson stated that he visited Europe for the purpose and had disposed of the European rights in many of his patent interests, and had also been a zealous student of the patent laws of the various countries, particularly England, France and Germany; and while he had been successful to the full extent anticipated, he remarked genially that he had not come back completely overburdened with the amount of gold he had realized, but that it would follow at regular intervals for a good many years to come.

"I understand," was the remark, "that the Johnson–Lundell surface contact system for electric railways was adopted in an important English city. Is this true?"

"Yes, and in competition with the whole world," was the reply from Mr. Johnson, given with evident zeal and satisfaction. "The gentlemen who were consulted in the matter of deciding what system to adopt were thoroughly informed of the state of the art in this field, the world over, and several independent investigations were made, and the fact that they all united in indorsing the Johnson–Lundell system is naturally very gratifying to Mr. Lundell and myself. The road in question is to be 10 miles of double track."

"You do not expect to control directly the introduction of this system in Europe, do you?" inquired the REVIEWITE.

"No; that would be impracticable. I have disposed of the Johnson–Lundell patents for Great Britain to the British Thomson–Houston company, and for France to the French Thomson–Houston company. In Germany I have made a tentative agreement with the Union Electric Company, of which your friend, Mr. Louis J. Magee, is director general, to be consummated upon the final issue of my patents for Germany, which have been delayed in the German Patent Office. This company will then control the patents, not only for Germany, but for Austria, Spain, Italy and Belgium. If you are interested, in addition, in knowing how American inventions are appreciated abroad, I would say that I have organized the Conduit and Insulation Company, of England, which company has purchased all the patents for my conduit business. Mr. Fred Bathurst has been my advance agent there for some time, and has recently had the honor of carrying off the medal and £25 prize for the best method of protecting house wiring from grounds. This is a victory for the interior conduit that I appreciate just as much as an American as a manufacturer. Mr. W. H. Preece, with whom you are well acquainted, no doubt, was chairman of the committee that made the award. The gentlemen interested in the English Conduit Company are the same who made a great success in promoting the Welsbach patents in England. I also disposed of the Lundell motor patents for England to J. H. Holmes & Company, Newcastle-on-Tyne."

"Well, Mr. Johnson," said the interviewer, "while it seems to me that you have been almost too busy to do much sight-seeing, did you notice any late electrical developments while you were abroad?"

"I can not say that I did observe anything particularly new. There were several things I learned that were of considerable interest to me. One is, how necessary it is to secure your German patents, in which country the manufacturing for the Continent is done. I consider myself much better posted on the patent laws and practice of Europe now than I was before I went over. One thing struck me as being materially different from our municipal methods in this country; that is, the prohibition of interference with the various underground plants already established. You can not cut open the streets of Berlin, for instance, and rearrange pipes, etc., belonging to other companies, no matter if you are willing to stand all the expense. When a plant is once put down, there it stays. As an indication of this, there is an open conduit electric railway in Berlin, complete in all the details of construction (installed by Siemens & Halske), of about three miles in length, yet at one point, in the vicinity of the Union Electric Company's offices, on account of some pipes already in the street, the system suddenly changes from underground to overhead trolley for a short distance. This seems singular to us in America, where changes are so constantly being made, in spite of protest against such interference."

Telegrams in Siberia.

It is stated that the Siberians are exercising themselves over the disorganized condition of their telegraph lines. A gentleman in Vladivostock says that a dispatch sent him from St. Petersburg on July 23 was not delivered until August 15. Inquiries at the local office for estimates as to the probable time for transmission generally provokes the reply, "Who knows?"

New Form of Ruhmkorff Induction Coil.

The X-ray discovery of Professor Roentgen naturally resulted in a great boom in the Ruhmkorff coil industry. There is no doubt that the number of coils made during the year 1896 quite exceeded the entire aggregate of all produced during the preceding decade.

The sudden and unprecedented demand taxed the resources of manufacturers, but in many instances caused such improvements in construction and mode of manufacture that the art was revolutionized, not only in the cost of the home product being reduced to a degree that foreign-made coils can no longer compete, but, further, in the increase of their value in a strictly technical sense.

One of the most notable points in coil manufacture, which is to be regretted, is the diminished degree of pleasing and artistic external appearance, which has apparently been sacrificed to the practical and scientific requirements.

NEW FORM OF RUHMKORFF INDUCTION COIL.

The illustration herewith shows a new form of Ruhmkorff coil, lately devised and put on the market by Mr. A. L. Bogart, of 22 Union Square, this city, which varies greatly from others in this respect, presenting a most ornamental, graceful and attractive appearance. The woodwork is of highly polished oak, the cylindrical body being covered with black velvet and the fittings nickel-plated.

A new form of break-piece is employed to obviate well known disadvantages in the common "vibrator," which permits of the necessary adjustments being readily made, without throwing the platinum contacts out of line, a common fault with the usual break. Any necessary degree of force of contact between the points can be obtained without producing a variation in the tension of the spring of the vibrating hammer or armature.

The change of form of coil not only greatly diminishes the table space required, but admits of a radical departure in the interior mode of construction, insuring better results in the matter of efficiency, but at the same time a greater degree of insulation, guarding against the common fault of breaking down in use.

These coils have been designed more especially for use in electric gas lighting, but may be employed for any class of work.

Electrical Sound-Money Club.

At a special meeting of the officers and committee of the Electrical Sound-Money Club, held at the offices of the treasurer, Capt. W. L. Candee, 253 Broadway, New York city, on Friday, January 8, it was voted that, in view of the fact that the objects for which the club was formed had been successfully accomplished, the club be dissolved. It was also voted that the treasurer be appointed a committee of one to dispose of, to some charitable object, the small balance of cash on hand. Those present at the meeting were: Dr. S. S. Wheeler, of the Crocker–Wheeler Electric Company, chairman; Capt. W. L. Candee, of the Okonite company, treasurer, and vice-presidents J. E. Ham, of W. R. Brixey; Charles Blizard, of the Electric Storage Battery Company; Gen. C. H. Barney, of the New York Telephone Company, chief marshal; A. C. Shaw, of the *Electrical Engineer*, and Stephen L. Coles, of the ELECTRICAL REVIEW, secretary.

Resolutions of thanks were passed for favors extended by various corporations, and a special vote of thanks was tendered to General Barney for the excellent work he did in organizing and commanding the 1,832 men turned out in the business men's parade by the Electrical Sound-Money Club.

Indian Mica Mines.

The mica industry is confined to the Hazaribagh district, and is gradually gaining in importance, according to *Indian Engineering*. Most of these mines are situated in the Koderma Government reserved forests, and the rest are scattered over portions of Gadis-Gawan, Domchanch, Khesmi, Mushnudih-Byria, Dorunda and Satgawan. The mica mines in the government estates and in the Dorunda and Satgawan estates, which are under government management, have been let out in accordance with the rules framed by the government. The greater number of the mines situated in the private estates are worked by Messrs. Christien & Company. The total output of all mica mines worked in the district in 1895 is reported to be 8,019 maunds, against 4,849 maunds in the previous year, and the total number of workmen employed in the mines, 5,409, against 3,718 in 1894.

A New Compressed Air Company.

Articles of incorporation of the Compressed Air Power Company, of New York city, capital $1,000,000, have been filed. The directors are William C. Whitney, Thomas J. Ryan, Frederick S. Pearson, William L. Elkins and W. W. Cooke. Over one-half the capital stock has been paid in.

Receiver for a Car-Wheel Company.

A receiver has been appointed for the Dorner & Dutton Manufacturing Company, Cleveland, Ohio, makers of car wheels and trucks for electric railway cars, gears and pinions and car heaters.

INTERESTING NOTES OF MODERN SCIENCE.

White light is distinctly better than yellow light for reading.

The flying-machine has not yet been reduced to a science.

The Echophone is the latest thing in the phonograph world, and is cheap and enjoyable.

A Swiss engineer named Taux has just patented a new process of tempering steel by electricity, which is said to make steel much harder, but gives it the desired elasticity.

What shall we answer to the question, What is electricity? Must we reply, *Ignoramus ignorabismus* (we are ignorant, and we shall remain ignorant)? We have already strong grounds for believing that we live in a medium which conveys to-and-fro, or periodic, movements to us from the sun, and that these movements are electro-magnetic, and that all the transformations of light and heat, and indeed the phenomena of life, are due to the electrical energy which comes to us across the vacuum which exists between us and the sun—a vacuum which is pervaded by the ether, and which is a fit medium for the transmission of the electro-magnetic waves.—*John Trowbridge.*

A terrible explosion of acetylene is reported from Berlin. The use of the gas is prohibited in Germany, but a chemist who had been experimenting with it believed he had deprived it of its explosive properties, and it is stated that the German Emperor was shortly going to the laboratory to witness the results of some of the chemist's research. An official of the State having expressed a desire to see some of the experiments, the inventor accordingly compressed the acetylene in a large iron or steel tube to the enormous pressure of "about 100 atmospheres," when the tube exploded, blowing him and three of his workmen to pieces, causing a report which was heard within a wide circuit. The "secret" is lost.

"How old are the Niagara Falls?" is a fascinating question to which geologists have given replies varying by tens of thousands of years. At first it was estimated that the Niagara River came into existence, through changes in the level of the land around the Great Lakes, about 55,000 years ago. Later, this was reduced to nearly 12,000 years. The celebrated geologist, Sir Charles Lyell, increased the estimate again to 35,000 years; but more recently others have lowered it to about 9,000. The latest estimate is that of Dr. J. W. Spencer, who, basing his conclusions on the most recent investigations, places the age of the river at 32,000 years, and that of the cataract at 31,090 years. At one period, many thousands years ago, the height of the falls was 420 feet.

In the course of his address to the Royal Society of Edinburgh, Professor McKendrick showed how it was possible to stimulate the sensory nerves of the skin electrically by an arrangement acted on by waves of sound, either as these were given off by the phonograph or as they were produced by any musical instrument or by the human voice. The sound was sent to a variable resistance transmitter—a kind of microphone—and the current passing through the microphone also passed through the primary circuit of an induction coil. The secondary circuit was connected with glass vessels containing salt and water. Every variation in time and in intensity of the music caused changes in the induction machine, and these changes were felt when the fingers were immersed in the glass vessels. The fingers felt a thrill corresponding to the tone and loudness and expression of the tune. It was not music, but the sensation corresponds to a part of music, rhythm and intensity. Thus the deaf could feel some of the elements of music, and it was also conceivable that, when spoken words fell on the microphone, sensations of electrical stimulation of the fingers might be explained, agreed upon and afterwards understood by the deaf. It was quite possible also that in those who once listened to music, and had become deaf, electrical stimulations of the skin might awaken a kind of musical feeling, long forgotten, but still capable of giving pleasure.

Signaling without wires has been something more than a dream amongst students of electricity and telegraphy for more than half a century—ever since Steinheil, who is regarded in Germany as the inventor of the telegraph, first directed attention to its possibility. From time to time experiments have been made in England and elsewhere with more or less success, the most satisfactory results perhaps being those attained last year, when the cable between the Island of Mull and the mainland having broken, several messages were transmitted, says *English World of Science.* The Marconi system, it appears, depends on electro-static effects on electric waves of so high a rate of vibration as 250,000,000 per second. These vibrations are, it seems, projected in the same way as those of light, and can be refracted and reflected; indeed, they are, said Mr. Preece, capable of all the phenomena which light exhibits. The invention was first experimented with on the roof of the General Post Office, and then for nearly a couple of miles on Salisbury Plain. The great difference between the system which had already been tried and Mr. Marconi's system was that in the former a wire on each side was necessary, and in the latter no wire was required. Vibrations were simply set up by one apparatus and received by the other—the secret being that the receiver must respond to the number of vibrations of the sender. The apparatus was exhibited. What appeared to be two ordinary boxes were stationed at each end of the room, the current was set in motion at one and a bell was immediately rung in the other. Mr. Marconi held the receiver and carried it about, the bell ringing whenever the vibrations at the other box were set up.

TELEPHONE NEWS AND COMMENT.

There is an era of improvement in telephone circles, and the Bell licensees are strengthening their plants and rights at many points.

It is reported that the local Bell company is installing free telephones in Negaunee, Mich., as a part of its plan of campaign against the Marquette County Telephone Company.

The Northwestern Telephone Exchange Company has bought the Rogers block, in St. Paul, Minn., in which its offices have been located during the past six years. The consideration was $50,000.

Mr. Edmund Christian, general manager of the Norfolk Creosoting Company, recently closed a contract to creosote 10,000 poles for the American Telephone and Telegraph Company, of New York.

The press of the country is still discussing the expiration of the Western Union–American Bell contract, and is evidently disappointed that no fight has opened up between these two well managed corporations. All in good time, you know!

At the annual meeting of the Northern Telegraph Company, of Manchester, N. H., the following officers were elected: President, ex-Gov. Frederick Smyth; directors, ex-Governor Smyth, Gen. Charles H. Bartlett and Col. Arthur E. Clarke; clerk, Mr. Arthur H. Hale.

The instrument statement of the American Bell Telephone Company for the month ended December 20, 1896, is as follows:

	1896.	1895.	1894.
Gross output	13,740	14,429	8,472
Returned	9,901	8,073	6,688
Net output	3,839	6,356	1,784
Year ended December 20:			
Gross output	192,086	176,060	89,493
Returned	94,773	89,094	72,818
Net output	97,313	86,966	17,175
Total outstanding	773,849	676,536	582,506

At the annual meeting of the Saco River, Me., Telephone and Telegraph Company the following officers were elected: Directors, Mark P. Emery, F. H. Hargraves, John Berryman, S. B. Sheppard, C. F. Clark; auditor, J. M. Clark. The directors organized and elected: President, Mark P. Emery; vice-president, F. H. Hargraves; secretary and treasurer, C. F. Clark; superintendent, C. F. Clark.

On January 6 a mortgage was filed in New York city for $20,000,000, given to the Farmers' Loan and Trust Company by the Commercial Cable Company, pledging all its telegraph properties, rights, privileges and franchises, including those of the Postal Telegraph Company. The mortgage is given to secure an issue of 500 four per cent gold bonds and debenture stocks, which aggregates the sum of the mortgage.

The annual meeting of the stockholders of the Missouri & Kansas Telephone Company will be held at the offices of the company, in Kansas City, Mo., on Wednesday, January 27, 1897, at 9 o'clock A. M., for the purpose of electing a board of nine directors for the ensuing year, of amending the by-laws, and for the transaction of other business. The present officers of the company are J. R. Mulvane, president; N. R. Ferguson, secretary, and Alonzo Burt, treasurer.

Many years ago the "United Lines" mortgaged their property, the Boston Safe Deposit and Trust Company ultimately becoming holders of the mortgage. The Western Union rented the privilege to string six wires upon certain poles to the "United Lines." It was to recover the rental for these lines that suit was brought, and, consequently, the recent verdict favoring the Deposit company goes largely to the benefit of the Western Union's coffers. The amount of rental sued for was $84,780.30, and the verdict allowed $39,088.10.

ELECTRIC LIGHT FLASHES.

The Springfield, Mo., Lighting Company have filed with the Secretary of State a notice of decrease of capital stock from $160,000 to $125,000.

A big electric light plant is to be constructed at Benwood Junction, Ohio, by the B. & O. Railroad to light the junction yards and also the Boggs Run and Wheeling yards. Work has already been commenced on the plant.

The Central Trust Company, of New York city, has foreclosed a mortgage which it holds on the property of the Wheatfield Electric Light Company, of North Tonawanda, N. Y., and advertises the company's property for sale on February 6.

The Board of Gas and Electric Light Commissioners has recommended that the price of arc lights furnished the town of Millbury, Mass., for its streets by the Millbury Electric Light Company shall be reduced to not exceeding $2,375 for the same service hitherto provided.

At the annual meeting of the Lebanon, N. H., Electric Light and Power Company the following officers were elected for the ensuing year: President, the Hon. W. S. Carter; clerk, Gilman C. Whipple; treasurer, Henry M. Day. Directors, C. D. Smith, J. E. Lincoln, G. S. Rogers, Col. F. C. Churchill, G. C. Whipple, M. V. B. Purmont, the Hon. W. S. Carter.

At the annual meeting of the stockholders of the Irwin, Pa., Electric Light and Power Company the following officers were elected: Dr. Charles E. Taylor, president; John L. Ridinger, secretary-treasurer; A. W. Humphries, C. F. Bilheimer, J. L. Ridinger, Dr. C. E. Taylor and Edward McGrew, directors. The company will increase its capital stock from $40,000 to $60,000.

Electric Lighting at the New Waldorf Hotel.

The new Waldorf Hotel, New York, is to have one of the most extensive electric plants in this country, and the Walker company, of Cleveland, Ohio, has secured the order for the electrical apparatus. In many respects this plant is unique and interesting, and possesses the distinguishing feature of being the largest isolated plant in the world, having a capacity of 25,000 lights, which are to be used only for lighting this building.

The engine-room is to be one of the most elaborate and handsomely fitted rooms ever designed for the reception of any kind of machinery. It is to be somewhat on the plan of the marble engine-room at Keith's theater, Boston, but will be much more elaborate and extensive, the walls, wainscoating and ceiling being of onyx and tastefully decorated. The floor is to be of marble of a pleasing design. Around the upper portion of the room is to be a balcony which completely surrounds the place, and from which guests and visitors to the hotel may view the machinery below. In this way the engine-room will be made one of the attractions of the hotel, and will certainly prove as interesting an entertainment to a large class of its patrons as the court-yard or finest parlors.

The generators are to be of the Walker type, manufactured in Cleveland, Ohio. There are to be six generators in all; four of them of 250 kilowatts capacity and two of 100 kilowatts capacity. The first named generators are of the extremely low speed of 90 revolutions per minute, and the other two run at 100 revolutions per minute. If these machines were wound to deliver their output when run at a speed which would be considered the maximum safe working speed, they would be capable of supplying 50,000 lights, enough for a good-sized city. This slow speed was desirable for two reasons; first, because the slow speed very much reduces the vibration of the machine and increases its life, and second, because this speed enables the direct connection of the dynamo to a Corliss engine. The engines are to be of the Allis-Corliss type, direct connected to the Walker generators.

A slow-speed plant always has a more impressive appearance than one of smaller units running at a high speed, however quietly, and therefore this arrangement of slow-speed machinery is especially suited to the nature of the Waldorf Hotel, which will, without doubt, be the finest institution of its kind in the country.

The machines are to be multipolar, the field frame being of cast-iron, while the pole-pieces are of laminated wrought-iron and are supplemented with a steel pole-shoe, this being a special feature of the Walker machinery, and not being found in any other type.

The armatures are to be of the regular straight-toothed formed coil type and are to be provided with the regular end flange, which forms a substantial cast-iron pocket to support and protect the ends of the coils. The windings to be of the barrel type; and by this means almost all the wire comes under the influence of the pole-pieces, and is active.

The machines are to be especially well finished. All brass parts are to be buffed, polished and lacquered, and the bodies of the machines are to be filled smoothly, enameled and elaborately decorated. The Walker machines have always been noted for the practically negligible movement of the brushes from no load to an enormous overload in order to provide sparkless running, but in these machines the armature reaction will be so slight that absolutely no attention of this kind will be required.

Mr. John Jacob Astor, the owner, is known for his knowledge and interest in electrical matters, and has determined to have the finest plant of its kind installed in his hotel, and toward this end has secured the services of the well known electrical expert and engineer, Mr. C. O. Mailloux, of New York city. Mr. H. McL. Harding, widely known in electrical circles, is the New York manager and successful general sales agent for the Walker company.

The Walker Company.

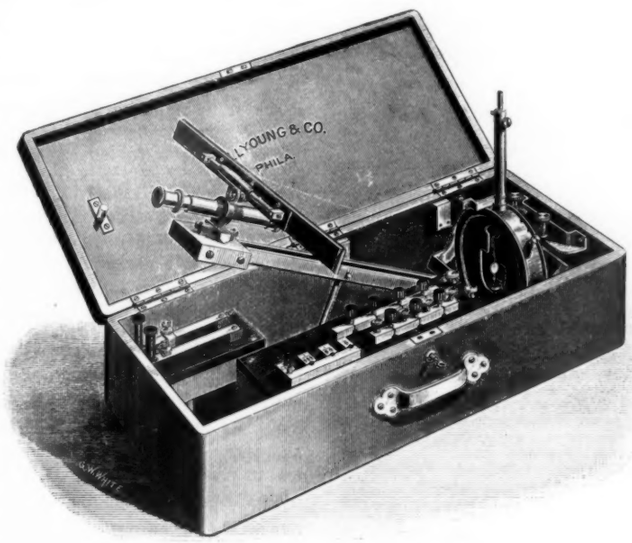
The Walker company is running its Cleveland, Ohio, works full force with about 1,800 hands, and its New Haven factory only partly full with 200 hands. It manufactures lamps and switchboards at New Haven and does all of its large work at Cleveland, Ohio. The company has developed a very large foreign business. The feature of its business is the supplying of large generators, from 1,000 horse-power up, and it has closed many contracts for this work. Through the securing of the Brooklyn Bridge, the new Waldorf Hotel and other large contracts the company has demonstrated that it is a factor in the electrical field. The company is a close corporation, as neither its stock nor bonds have been offered to the public. The company is capitalized for $2,500,000 stock and the same amount of bonds, although some of the stock and bonds, particularly the bonds, are still in the treasury.—*Wall Street Journal.*

A Portable Cable-Testing Set.

Messrs. Elmer G. Willyoung & Company, of Philadelphia, have recently brought out a very compact and portable form of testing set for making measurements of the insulation resistance of underground and other high-grade cables.

As shown in the illustration herewith, the set is made up of galvanometer, telescope and scale, high resistance of 100,000 ohms, shunts, keys and terminals for attaching the ends of cables being tested, the method of measurement being the usual one of direct deflections. The galvanometer is swung on gimbals and is adjustable, about two axes passing through its center; the one perpendicular to its plane, the other lying in its plane. The adjustments are controlled by milled-head screws.

The telescope and scale are attached to the extremity of an arm which pivots about an axis lying in the plane of the galvanometer and passing through the center of the mirror. This arm rests flat in the bottom of the case when not in use, while the scale slips out a kind of bayonet catch attached to the telescope casting and is held in a pair of holders seen at the side of the box. In consequence of the passing of this axis through the mirror center, the altitude and azimuth adjustments of the telescope relative to the supporting arm may thus be made once for all. The image of the scale must always reappear in the telescope by merely raising or lowering the supporting arm so as to secure the original angle with the galvanometer front.



WILLYOUNG'S PORTABLE CABLE-TESTING SET.

The shunts of this instrument are four in number, reducing the current passing through the galvanometer to one-tenth, one one-hundredth, one one-thousandth and one one-thousandth of its original value. These shunts are not placed directly across the galvanometer resistance, as is usual, but across the galvanometer resistance plus an extra 100,000-ohm coil, the virtual resistance of the galvanometer circuit thus becoming over 100,000 ohms instead of only about 1,500 or 2,000, as would otherwise be the case.

This 100,000-ohm coil has another very important function, to understand which attention must be directed to the well known fact that the lead sheathing of a cable is itself a conductor for "return currents." These currents are constantly varying in value and location upon the cable, as the number of motors using power varies and changes in position. These variations of flow in the sheathing produce corresponding variable currents in the core of the cable. Hence when a steady current is sent from core through the insulation to ground, as it is in the direct deflection method of measurement, then variable currents superpose themselves upon the steady current and cause the motion of the galvanometer needle to be so erratic as to completely mask the steady deflection obtained. To overcome this difficulty the 100,000-ohm coil above is wound with a maximum of self-induction, thus wiping out these variable currents, but offering no impedance to the steady current of measurement. This arrangement of inductive 100,000-ohm coil, as also that of shunts outside of coil and galvanometer in series, is the invention of Mr. W. D. Gharky, assistant superintendent of lines and cables for the Union Traction Company, of Philadelphia.

All parts of the instrument possess the highest insulation, all metals and all conductors being mounted upon hard rubber, the galvanometer, coils, etc., being both moisture and dust proof. The apparatus is for sale by James G. Biddle, Drexel Building, Philadelphia, sole agent for Willyoung instruments.

Brooklyn Elevated Road Feels Trolley Competition.

At the annual meeting of the Brooklyn, N. Y., Elevated Railroad, held last week, it was shown that the gross earnings of the road for the year were $1,718,688 and the net earnings $688,699. The passengers numbered 32,608,587, a decrease of 7,460,132 compared with the previous year. In his annual report President Uhlmann says:

The large falling off in the passenger receipts of the company is to be ascribed to two causes—the hard times of 1896 and the competition of the surface roads. The effect of the hard times is shown by the diminished receipts of transportation companies throughout the country.

Negotiations are pending and should be completed whereby the railroads of the Kings County and Brooklyn Elevated companies would be operated under one management by traffic agreement or merger, on a fair basis. This would immediately result in considerable reduction in operating expenses of the combined companies, give better service to the traveling public and result in increased receipts. New capital, however, will be essential to enable the combined companies to change their motive power, so that without increasing operating expenses cars could be operated at more frequent intervals, which of itself would add materially to earnings.

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, JAN. 13, 1897.

CONTENTS.

	PAGE
Views, News and Interviews	13
The Underground Trolley in New York City	13
A New Trolley Road in New York City	14
The "Espersen" Shade Lamps	14
Items of Interest	14
Roentgen Rays and Tuberculosis	14
Interview with Mr. Edward H. Johnson	15
Telegrams in Siberia	15
New Form of Ruhmkorff Induction Coil	15
Electrical Sound-Money Club	15
Indian Mica Mines	15
A New Compressed Air Company	15
Receiver for a Car Wheel Company	15
Interesting Notes of Modern Science	15
Telephone News and Comment	16
Electric Light Flashes	16
Electric Lighting at the New Waldorf Hotel	17
The Walker Company	17
A Portable Cable-Testing Set	17
Brooklyn Elevated Road Feels Trolley Competition	17
Electric Railway Work in England	18
Electricity as an Aid to the Burglar	19
Trade Talk	19
A Good Contract	19
Contemporary Electrical Science	19
Western Union Has Not Purchased Western Telephone Construction Company	19
Incandescent Lamp Filaments	20
Huntress & Ewing	20
A New Electric Railway Line Opened in Pittsburgh	20
Literary	20
Electric Railways	21
A Vest-Pocket Polarity Indicator	21
He Wanted His Telephone Directory	21
A Handsome Calendar	21
Electro-Chemical Industries	22
Dr. Perrine and the Chicago School of Electricity	22
The Cable Must Go!	22
Personal	22
Syracuse Storage Battery Company To Be Sold Out	22
Our Canadian Letter	23
New York Electrical Society	23
A Telephone Patent Decision	23
New Discoveries of Platinum	23
American Electric Telephone Company	23
A New and Improved Panel Board	23
Electric Separators in Mining	23
Union Traction Company Not Sold	23
Kind Words	23
New York and St. Augustine	23
Advance Information	24
Kindred Interests	ix
Electrical Patents	x

INDEX OF ADVERTISERS.

COVER PAGES. PAGE

Abendroth & Root Mfg. Co., boilers xvi
American Electrical Works, insulated wire. i
Armington & Sims, engines xvi
Babcock & Wilcox Co, boilers xvi
Bristol Co., recording voltmeters, etc i
Bunnell & Co., J. H., dry batteries i
Campbell & Zell Co i
Correspondence School of Technology i
Crefeld Electrical Works i
Crocker-Wheeler i
Day's Kerite, insulated wire ..... i, viii
Dixon, Jos., Crucible Co., belt dressing xvi
Electric Appliance Co., supplies i
Fort Wayne Electric Corporation xvi
Greeley, The E. S., & Co., electrical supplies. i
Hampson, E. P., & Co., engines xvi
Interior Conduit and Insulation Co., Lundell dynamos and motors ..... i, v
Iron Clad Rheostat Co i
Lombard Water-Wheel Governor Co xvi
New York Insulated Wire Co., Grimshaw wires and cables i
New York & Ohio Co i
Okonite Co., insulated wire ..... i, xvi
Partridge Carbon Co., motor and generator brushes i
Roebling, John A., Sons Co., lead-encased cables xvi
Safety Insulated Wire and Cable Co i
Standard Paint Co., insulating compound i
Stanley Electric and Mfg. Co xv
Stirling Co., water tube boilers xvi
Thayer & Co i
Walker Co ii

INSIDE PAGES.

Addyston Pipe and Steel Co vi
American Bell Telephone Co xiii
American Electric Telephone Co., long-distance telephones xiii
American Engine Co., American-Ball engines iii
Baker & Co., platinum vii
Bliss Co., E. W iii
Bolgiano Mfg. Co x
Brady, T. H., Brady mast-arms vi
Brill, J. G., Co xii
Brixey, W. R., Day's kerite wires and cables. viii
Brush Electric Co xii
Central Electric Co., electrical supplies iii
Central Mfg. Co vi
Chase & Vale, patent attorneys x
Climax Gas Engine Co vii
Clonbrock Steam Boiler Co vii
C. & C. Electric Co iii
De Veau & Co xiii
Diehl Mfg. Co iv
Dyer & Driscoll, patent solicitors x
Edison Decorative & Miniature Lamp Department, X-ray apparatus xi
Edison Mfg. Co xi
Edwards & Co xi
Elwell-Parker Electric Co. of America viii
Empire China Works, porcelain specialties. ix
Eppenger & Russell Co., Valentine subway electrical conduit vi
Eyanson & Armpriester vi
Faraday Carbon Co., carbons xiii
Forest City Electric Works xi
Frei & Co., G. A., X-ray supplies xi
Globe Electric Heating Co viii
Gordon-Burnham Battery Co xi
Hoopes & Townsend vii
Hooven, Owens & Rentschler Co., electric railway and electric light engines iii
Huebel & Manger ix
Imperial Porcelain Works iv
India Rubber and Gutta Percha Insulating Co viii
Interior Conduit & Insulation Co v
International Correspondence Schools 24
Jewell Belting Co xii
Knott, L. E., Apparatus Co xi
Leffel, Jas., & Co., water wheels vii
Lehigh Valley Creosoting Co., creosoted lumber vi
Lynn Incandescent Lamp Co ix
Marshall, Wm., condensers x
Mason-Maxwell Telephone Mfg. Co xiii
McIntire, C., Co., The, connectors and terminals 24
McLeod, Ward & Co iii
Metropolitan Electric Co xiv
Mexico Telephone Co xiii
Michigan Electric Co viii
Morris, Tasker & Co vii
Murdock & Taber xiii
New England Engineering Co vi
New York Central Railroad x
New York Telephone Co 24
Novelty Electric Co., supplies vi
Ostrander, W. R., & Co., supplies vi
Pacific Electric Co iii
Partrick & Carter Co., electrical supplies for housework ix
Phillips Insulated Wire Co., wire viii
Replogle Governor Works xii
Ritchie & Sons, E. S xi
Rodrigues, M. R iii
Royce & Marean, electrical supplies xii
Schiff, Jordon & Co., carbons iv
S. E. I. Co viii
Sessions Foundry Co iv
Solar Carbon and Manufacturing Co viii
Spring Park Laboratory xi
Standard Thermometer & Electric Co iv
Sterling Supply & Mfg. Co xiv
Stewart & Co., F. W vi
U. S. Mineral Wool Co vi
Viaduct Mfg. Co., telephones, etc xiii
Washington Patent Agency x
Wedderburn & Co., John, patents x
Western Electric Co xii
Western Telephone Construction Co xiii
Westinghouse Electric & Mfg. Co xiv
Weston Electrical Instrument Co., measuring instruments viii
White-Crosby Co., contracting engineers ... 24
Whitney Electrical Instrument Co 24

What has become of the old Daft electric lighting franchise for New York city? It ought to have considerable value, for, if memory serves us, its provisions were broad.

The George Washington Lighting Company has been incorporated in New Jersey. With this name it certainly should have truthful meters and there should be no cutting down of apple trees or any other kind of trees to make room for the electric wires unless the consent of the owner is first secured.

The General Electric Railway Company, of Chicago, seems to be a child of misfortune, with troubles of its own. After getting its franchise its tribulations did not cease. It is now announced that on January 7 the well known Mr. Maloney, of Illinois, instituted *quo warranto* proceedings in Chicago against the company attacking its organization.

The rumors to the effect that the Western Union Telegraph Company is about to enter the telephone field are quite numerous, but lack substantial authenticity. Still stranger things have happened, and if the Long-Distance Telephone lines cut into the business of the telegraph company very materially, this slow-moving but powerful telegraph company may yet decide to take the offensive.

The decision in the Berliner telephone case has not yet been given out by the United States Supreme Court. On Monday last a number of prominent persons interested in the case were in Washington, attending the Supreme Court meeting, representing both sides of the case, and all confident that the decision would be announced, and that it would be favorable. But all were doomed to disappointment, as no decision was rendered. It is expected next week, or the next, or the next.

The Siemens & Halske–Fort Wayne deal, which the readers of the ELECTRICAL REVIEW alone were privileged to see announced last week, is likely to be a formidable competitor for the electrical business of the country. The two large branches of the industry, electric lighting and electric railways, will be the scene of the contest. It is thought in the West that Mr. Samuel Insull, president of the Chicago Edison Company, is interested in the new organization. This would undoubtedly strengthen the combination, as Mr. Insull is thoroughly familiar with the manufacturing field.

ELECTRIC RAILWAY WORK IN ENGLAND.

In referring to what may be expected to happen in electrical progress in England during the ensuing year, London *Lightning* says:

In 1897 the scope of the industry will be greatly extended by the demand for steam and electrical plant and accessories for tramway work. American firms, with all the advantages of an immense home demand, mean to do their best to corner the British trade in this department. Fortunately, however, our electrical engineers are not, as a class, afflicted with the apathy of many of the old-established engineering firms. They are as keen and energetic a set of men as are to be found in this or any other country, and the uphill fight from which electric lighting has now emerged victorious has taught them many lessons—amongst others, *how to learn*.

The sale of American electric railway appliances in England has already been comparatively large. It is also understood that one of our prominent truck manufacturers has in contemplation the establishment of a truck factory in England. We do not believe that Americans have any idea of exactly cornering the electric railway market in England, because they know such a thing would be impossible. But we do believe that they intend to sell just as many goods as they can while our British brethren are making up their minds what to do. "Hustle" counts in England as well as in America.

Considering the fact that our cousins across the pond are just about a decade behind the times in electric railway work, and also considering the marvelous progress made in that field in the United States during the last 10 years, they might do worse than to turn over their railway work to American engineers and manufacturers. The installations would undoubtedly be more satisfactory than if home talent were employed, in view of past experience. But home talent will be employed just the same, and Americans know it.

It is a good thing that English electrical engineers have learned how to learn—that's half the battle won.

In the death of General Francis A. Walker, president of the Massachusetts Institute of Technology, technical education in the United States loses one of its ablest and most broad-minded exponents. General Walker knew and was beloved by his students. The many "Tech boys" in the electrical field will certainly feel in his death the loss of a mentor and a friend whose place can never be filled. He was truly a great man.

Electricity as an Aid to the Burglar.

[*From Electrical Engineering*]

We published a short note about three years ago in which attention was called to the possibility of using an electric current for the purpose of opening so-called burglar-proof safes. At that time there was apparently but one safe on the market which had successfully resisted the efforts of competent explosive experts. All circumstances seemed to point to this as the one protection calculated to baffle the efforts of the modern burglar, possessing a scientific knowledge of high explosives, and all seemed willing to admit that in explosives were to be found the most powerful aid to the burglars' art. The construction of heavy vaults of masonry, usually lined with steel, simply aided the scientific burglar; for, sheltered by this convenient sound-deadening structure, it was an easy matter to use explosives in quantities which would have been impossible under any other conditions without causing a disturbance and wreckage, sure to result in detection or capture. To place a heavy explosive-resisting safe in a lightly constructed vault or in the open seemed then to be the highest stage of burglar-resisting art. Efforts were also made to construct double-cased safes which would possess such acoustic properties as to make the firing in an open room of even an ordinary charge of explosives a dangerous proceeding. Between these two arts of protection lay the greatest safety at a banker's or jeweler's command.

In investigating the possibilities of using electricity upon an explosive-resisting safe, it appeared, in our opinion—and we were supported by two or three of the most competent engineers in the West—that it was not at all a question of possibility—that admitted of no doubt;—only one of probability and practicability. This did not meet the full acceptance of safe experts at the time, notwithstanding the frankly voiced opinions of the electrical experts. Our published opinion was allowed to remain neglected, occasionally brought to mind by suggestions made from time to time that burglars would soon use the enormous heat of an electric arc for drawing the temper or penetrating the sheets of steel of vaults and safes.

The opinion expressed has now received verification, for in recent experiments we witnessed an arc of 40 to 50 volts, with a current of 300 to 500 amperes, penetrate in three to ten minutes safe walls three to six inches thick, and as a demonstration of the masses of metal which could be operated upon, a rough steel ingot, perhaps six by seven by ten inches, was penetrated with a diagonal jagged hole from one and one-half to three and one-half inches in diameter, the thickness of metal pierced being about eight or nine inches.

What construction can resist this concentration of heat? The hardest steel is penetrated as easily, even more easily, than the softest iron, while the cast metals used in the heretofore invulnerable safe melts and runs like water, making, from its very nature, an easier safe to open than those built of the rolled metal, which, as is well known, remains plastic under a high degree of heat, and has not the tendency to flow from the arc and leave an entirely unobstructed passage. In penetrating the wrought-iron or mild steel it was frequently necessary to allow the arc to play on the semi-plastic mass being melted, to keep it from congealing and preventing further progress. This took somewhat longer time. The cast safes, owing to the fact that the metal was necessarily designed to flow, in order that the safe could be cast from the pattern, did not resist the arc nearly as long for a given penetration. The metal readily flowed, and a hole large enough to permit the safe to be opened was quickly made; this without undue noise or aught to give warning.

The method adopted to guard against this new agency of attack also possesses an interest to the electrical fraternity, inasmuch as an electrical alarm has been selected as the most effective means of protection from electrical attack. *Similia similibus curantur.*

TRADE TALK.

To a casual visitor, New England—that is, New Haven, Hartford, Springfield, Boston and the industrial centers—from an electrical standpoint, presents a much more hopeful and encouraging condition in a financial and business way than three months ago. Spring construction work will soon be under way and the feeling is strong that it will be of a much more substantial nature than last year. The electric lighting interests are receiving new impetus by the advent of several new arc lamp companies with lamps of new construction; several of the companies which are prominent in the trade as manufacturers of the bulk of the supplies used in interior wiring, such as sockets, switches, rosettes, cut-outs, are preparing for a very large output. In underground electric work promise is apparent that much new work for telephone and lighting will be commenced at the thawing of the ground. An indication of this lies in the fact that in an interview with a representative of the ELECTRICAL REVIEW, Mr. E. H. Phipps, president of the Connecticut Pipe Manufacturing Company, of New Haven, said that the company had received an unusually large number of inquiries relative to conduits and subway matters.

The large wire and metal working factories in Waterbury, at least to an observer, appear to be in a more active condition, and the vast plant of the Washburn & Moen Manufacturing Company, at Worcester, is said to be increasing its product of electrical material.

A Good Contract.

The Sterling Supply & Manufacturing Company, 97 Bank street, New York city, has secured the contract for the "inside" equipment for 150 open cars, just ordered from the John Stephenson Company by the Metropolitan Street Railway Company, of New York. This contract includes brakes, fenders, sand boxes and fare registers. The Sterling Supply & Manufacturing Company is to be congratulated on securing a contract of such magnitude and of so much importance.

Contemporary Electrical Science.

The most important communication to the October number of the *Nuovo Cimento* is that by Professor Cardani on the resistance of electrolytes to alternating discharges. The main conclusion arrived at is that electrolytes do not conduct such discharges through the surface layers, but evenly throughout their mass; that, in fact, they obey Ohm's law, whatever the frequency of the oscillations. Herein they differ markedly from metallic conductors. Their impedance is simply equal to their resistance to continuous currents. Cardani proved this by means of his derived-circuit petroleum thermometer, a method which appears destined to play an important part in the determination of impedance and resistance under difficulties. He operated with solutions of copper sulphate and of sulphuric acid, varying the length, sectional area and concentration of the columns of liquid. In every case the resistance varied in the same manner as for continuous currents.

Adolfo Petrozzani describes some experiments on the discharge of a hollow brass ball suspended by various insulating rods under otherwise identical conditions. It appears that the worst thing to do, if the charge is to be maintained, is to cover the glass rod with a layer of paraffine. The charge is dissipated twice as fast as with a bare rod. Ebonite is a trifle better than bare glass. Varnished glass is the best insulator of all.

A. Stefanini describes a simple and effective lecture experiment to show the chief vacuum phenomena, which is perhaps not sufficiently widely known. A Boyle's law tube with a rubber continuation ending in a reservoir of mercury is provided with a stop-cock and two electrodes, one at each end. By raising the reservoir, mercury is driven up as far as the stop-cock. On sufficiently lowering the reservoir a vacuum is created, and the degree of exhaustion may be modified by altering the length of the vacuum. A great variety of vacuum phenomena may be shown with the simplest resources.

A very suggestive excursion into the mathematical theory of cathode rays is made by A. Garbasso. To test whether they are projected particles or waves of some kind, he inquires whether any continuous change of velocity of propagation is possible, which would make the path of the rays a helicoidal curve such as is actually observed when the rays are deflected by a magnet. From the equations governing the propagation of light in a medium of varying refraction index, he shows that a magnetic field is incapable of producing helical curvature unless the curve degenerates into a straight line, which in practice it does not. Hence the vibration theory must in this instance give way before the more successful corpuscular theory. The question, which so far has been almost an international one between England and Germany, is one of profound interest. It will be well not to pin our faith on any *ex cathedra* utterances on this matter until the crucial experiments are forthcoming.

Vicentini and Packer describe some Tesla experiments made with large glass plates covered with tinfoil. Also an instrument which they call the "electric siren," worked by Tesla discharges, and producing notes from a low pitch upwards to a pitch transcending the limits of hearing.

A. Roiti defends his "cryptochrosis" experiments against Salvioni's criticisms, quoting further cases to show that the same tube can send out X rays of different penetrating power.

O. M. Corbino investigates the change of specific inductive capacity of glass when subjected to tension at right angles to the field. He concludes that the dielectric constant diminishes, and (somewhat hastily) that the diminution is proportional to the tension.

The same number contains an appreciative obituary notice of the late Professor Bartoli, of Catania, by his friend and colleague, E. Stracciati. To those who do not remember his work on organic synthesis, electric conductivity and solar heat, or his classical researches on the specific heat of water, a list of his 145 contributions to scientific literature will give some idea of his stupendous industry and energy.—E. E. F., *London Electrician.*

WESTERN UNION HAS NOT PURCHASED WESTERN TELEPHONE CONSTRUCTION COMPANY.

A RUMOR DENIED.

The Chicago *Tribune* last Saturday stated that "Western Union will purchase plant of the Western Telephone Company here, and some long-distance telephone lines south of Richmond, Va. An independent telephone company will be incorporated next week."

In response to a telegraphic inquiry from the ELECTRICAL REVIEW, President Keelyn, of the Western Telephone Construction Company, of Chicago, sent us the following dispatch:

TO THE EDITOR OF ELECTRICAL REVIEW:

Western Union Telegraph Company has not purchased our company. I can not give any information about Virginia arrangements. The very nature of the business absolutely involves both the Western Union and Postal Telegraph companies, and both will go into the telephone business, and the Bell company will go into the telegraph business, either by combination or separately. Circumstances make a combination of these interests utterly impossible. Common sense will ultimately dictate that the profit in the telephone business is too much to be lost by the Western Union and Postal companies through sentiment or fear of the Bell company. The Bell company could not fight either of them successfully because of embarrassing contracts.

J. E. KEELYN.

Chicago, January 11.

INCANDESCENT LAMP FILAMENTS.

THEIR VALUE AND USE—EDISON'S FIRST EXPERIMENTS—THE REDUCED PRICE OF INCANDESCENT LAMPS AND THE GREAT NUMBER CONSUMED ANNUALLY.

We publish below part of an interesting article that recently appeared in the daily *Sun* of this city. It was evidently inspired by an editorial note in the ELECTRICAL REVIEW calling attention to the great value of a pound of incandescent lamp filaments, and the subject is handled with a degree of accuracy and understanding that is often lacking in the lay press when treating of technical subjects:

Somebody writing in a technical newspaper recently directed attention to the enormous value which these filaments have when estimated by the pound avoirdupois, and a *Sun* reporter went to the lamp works of the General Electric Company at Harrison, N. J., to look into this interesting subject. Superintendent Eyre became interested in this view of the subject at once, although it was not a new one to him, and, summoning some of his department assistants, he made, with their help, some very interesting calculations.

The standard lamp for general use is of 16 candle-power. Out of the 20,000,000 electric lamps used every year in the world this size is believed to number 80 per cent. A carbon filament for that sized lamp measures $\frac{4}{1000}$ of an inch in diameter and 10 inches in length, and 200 of these put upon a scale weighed 10 grains. Mr. Eyre's calculations soon demonstrated that, with 7,000 grains to the pound avoirdupois, it would take 140,000 of these filaments to make a pound, and that at the current market rate for these, $10 a thousand, their value would be $1,400. A man can carry 150 pounds in a sack on his back, and if the sack were filled with such bits of carbon his load would be worth $210,000.

Take but a single pound of these filaments and stretch them out in a continuous straight line, and they would cover a space of 113,333 feet, or about 21.3 miles. The world's product for the year would reach 3,157 miles, and in a little more than seven years, at the present rate, would reach completely around the globe.

But the value of the filament of this size is small when compared with that of some for the smallest of the lamps made. Whether a filament be for large or small lamps, it costs about the same sum to the market, but its candle-power makes a great difference in its size and weight. The smallest of the incandescent lamps used for regular purposes is of three candle-power. For this the filament is of a plain U shape, and is $\frac{6}{1000}$ of an inch in diameter and $\frac{3}{4}$ of an inch long. Mr. Eyre's calculations showed that there would be 1,000,000 of these to a pound, and these would be worth $10,000. But, again, the lamp makers manufacture many tiny lamps for surgical and dental uses. The smallest of these is called the pea lamp. Its tiny bulb is about one-fourth of an inch in diameter, and physicians use it at the end of probes and similar instruments to illuminate the interior of the human body. Its carbon filament is but $\frac{5}{1000}$ of an inch in diameter and but one-eighth of an inch long. This is but the 320th part of the volume of the 16-candle-power filament, and, as a consequence, it was easily figured that it would take 44,800,000 of these to make a pound, and their value would be $448,000.

"Whew!" said Mr. Eyre, when he had verified his figures. "I did not know that we had anything so valuable about the factory. I think some time I will have to walk off with a pound of these."

The head of the filament department laughed. "Where would you get them?" he asked. "In the whole history of this factory we never made anything like a pound of them, and if we had, where would you sell them?"

"Well, an ounce would do," said Mr. Eyre.

Of course, the larger the filaments are the less they are worth by weight, but whether they are of a value of $1,400 a pound or $448,000, it is interesting to consider that practically all of this value is the product of human labor and skill. The material out of which they are produced costs but a few cents. Their history and the way in which they are produced are known to but few except those who are intimately associated with their production.

In the early days of experimenting with the electric light the current was passed through a thin wire of platinum. The reader may remember at that time Mr. Edison had agents looking all over the world for new sources of supply of that rare metal. Then, as now, nearly all the platinum of the world came from two districts in the Ural Mountains in Siberia. Had the people remained dependent upon platinum for their lamps they would have needed for each one a piece of wire $\frac{6}{1000}$ of an inch in diameter and 15 inches long, and this at the present price of platinum—$13 an ounce—would cost 10 cents. The world's whole product of this metal in 1887 was but about 9,500 pounds, and would have been inadequate for the present lamp supply. Even to-day, with a product of perhaps 12,000 or 13,000 pounds, there would be but a small margin left after making 20,000,000 lamps, and merely the cost of the filaments would be $2,000,000. It was at this juncture that Edison conceived the idea of using a carbon filament. He confided his idea to his chief assistant, Mr. Batchellor, and they began work one evening. It is one of Edison's peculiarities that, once started upon a piece of work, he does not stop for sleep or sometimes even food. The material from which he proposed to make his filament was a spool of Clark's cotton thread. All that night Edison and Batchellor worked and all the next day, and then again all night. At the end of 36 hours they had produced a perfect filament. Mr. Batchellor took it up and they marched with it toward the bench where a glass-blower was at work. Just as they reached the bench the carbon broke. "Edison," cried Batchellor, "we won't sleep until we make one." Back they went to work, and late in the afternoon they completed a second carbon loop. Again they marched with it to the glass-blower's bench and placed it there in safety, but just then a jeweler's screwdriver rolled over it and broke it. Batchellor was an even-tempered man, but that was too much.

"I'm damned!" he cried. "Job got too much reputation for patience on a small capital."

There was no giving up, however. Back to work the two men went. Experience had been a good teacher, and before night they had completed a third filament, got it safely mounted in a bulb, exhausted the air and set it glowing with the electric current.

For the great illumination at Menlo Park, which followed, the filaments were made of pieces stamped out of visiting cards, and many after that were stamped from paper. Others were made from slivers of bamboo. Weston was the first, perhaps, to use vegetable parchment for the purpose, but that is what the General Electric Company use today. This is virtually the material out of which artificial silk is made. Just the materials and process used no filament maker will tell, for this is one of the last of the trade secrets, and the only one about lamp making. A mixture of vegetable matter, rich in carbon, like paper stock or cotton, is taken and is digested with sulphuric acid or chlorides until it is a gummy mass about as thick as dough. This is forced through dies, just as vermicelli is made, and it comes out in endless strings. For 16-candle-power filaments the die has an aperture $\frac{22}{1000}$ of an inch in diameter. The string of paste falls into a jar partly filled with a secret liquid, where it lies in coils. Then it is run out, washed and partly dried and coiled on cylinders to become entirely dry. Then it is cut into proper lengths, with allowance for shrinkage, and taken in bunches and wound on shapers to give it the form desired and set into form by being heated slightly. Now it is ready for carbonizing. This is done by packing the bunches in crucibles with sifted charcoal or other carboniferous substances, and, after sealing, by baking it in a hot fire for one and one-half day. When it is taken out every thread is black and shiny and seems to have a perfect surface, but it is not ready for use. Now each filament is taken separately and clamped with each end in a live electric current, and while it is immersed in a vapor of gasoline the current is passed through it. The effect is to deposit upon the white-hot filament a coating of lamp-black, or carbonized gasoline, which gives it qualities not otherwise obtainable. In the early days of their manufacture only eight 16-candle-power lamps could be lit by one horse-power, but now 15 are used. The filament is now ready to be mounted in the lamp.

There are 30 lamp factories in the United States. Only about half of these make their own filaments. The others buy them from special manufacturers. One of the largest of these filament makers is in Newark, N. J. All the lamp factories in the United States produce altogether about 11,000,000 lamps a year. Of this product, 6,000,000 are turned out at the factory of the General Electric Company at Harrison.

Unlike those fragile filaments which Edison produced, the new ones are handled easily, and although they break easily when bent sharply, they are so springy that they can be drawn straight out without danger and then allowed to fly back to shape.

With the development of the carbon filament has come a gradual change in all the processes of lamp making, until the price of 16-candle-power lights has fallen gradually from $1.25 each to 20 cents, or even a trifle less when taken by contract in large lots.

Huntress & Ewing.

Messrs. F. E. Huntress and George C. Ewing have formed the firm of Huntress & Ewing, with offices at 8 Oliver street, Boston, Mass., to deal in electric railway equipments of all kinds, motors and dynamos, new and second-hand. Mr. Ewing has been for some time in the same line of business at 620 Atlantic avenue, Boston. His new connections will give him increased facilities for handling orders promptly and satisfactorily.

A New Electric Railway Line Opened in Pittsburgh.

A few days ago a new electric railroad, called the Hilltop line, was opened in Pittsburgh. The Hilltop line is a branch of the Pittsburgh & Birmingham Traction Company, which connects the old city of Pittsburgh with those districts situated on the southern shore of the Monongahela River. The Hilltop line runs across the Monongahela over the Smithfield street bridge and goes up Brownsville avenue, which road has a grade of 15 per cent. By this road the suburb of Knoxville is reached. The line has been in great demand because it will afford rapid-transit facilities to about 50,000 people who have hitherto been entirely dependent upon inclines and such walking accommodations as unpaved streets afforded.

The Birmingham Traction Company operates 22 cars on the Hilltop line. The cars are equipped with two 50-horse-power Westinghouse motors and controllers. To take care of the increased traffic occasioned by the opening of this line, the Birmingham Traction Company has recently remodeled and re-equipped its power-house at Thirty-first and Carson streets. This power-house was equipped with generators of an older make. They have all been thrown out and three 700-kilowatt Westinghouse generators have been substituted.

LITERARY.

We have received from Mr. Nicholas S. Hill, Jr., city engineer of Baltimore, Md., a copy of "Report of the Electrical Commission of Baltimore City to the Mayor and City Council on a General Subway System to be Owned by the City of Baltimore."

Poultney Bigelow in the *North American Review* for January enters into the subject of "The German Press and the United States," presenting with keen insight the several causes which make us at present the target for Prussian press malevolence.

The *Inland Printer* for January provides a table of contents of admirable variety and interest. The exploiting of all that is new in the art of printing and engraving is the special field of this publication, which ranks at the head of American trade journals. The beauty of its workmanship is unparalleled. Two dollars per year, 20 cents per copy. The Inland Printer Company, Chicago.

The 18th annual number of the *Tradesman*, published at Chattanooga, Tenn., contains over 260 pages and presents the most complete, exhaustive and valuable review of the South, its resources, development and possibilities, that to our knowledge has ever been published. The special articles are from leading thinkers, statisticians and business men, and the information given is the result of careful investigation and practical knowledge.

Electric Railways.

The electric street railway property at Savannah, Ga., was sold by auction on January 5, for $210,000, to a syndicate of New York bondholders.

The car barns and engine-house of the Raleigh, N. C., Electric Street Railway was destroyed by fire. The loss is $50,000, The plant is to be rebuilt at once.

The Buffalo & Niagara Falls, N. Y., Electric Railway Company has appealed to the appellate division of the Supreme Court from a verdict of $1,069.83, secured against the company by Dominick Greiser, a Tonawanda saloon-keeper, for damages.

The Cincinnati, Ohio, Newport & Covington system has passed into the hands of a new board of directors. The general offices will be removed from Cleveland to Cincinnati. The new board is guaranteed control for two years. A contract was concluded with a syndicate to take $500,000 second-mortgage bonds at 70 per cent and accrued interest.

A resolution to issue $150,000 of first preferred six per cent gold bonds has been adopted by the reorganization committee of the Dallas, Tex., Consolidated Street Railway Company. The proceeds will be used in changing the lines of the company to electric power. The reorganization committee is composed of Messrs. John Gill, William H. Blackford, J. Wilcox Brown, Douglas H. Gordon and Harry Jenkins.

Trial has commenced before Judge Dickey of the suit brought by the Brooklyn, N. Y., Elevated Road to restrain the Nassau Electric Road from carrying passengers for a single fare of five cents from the city to Coney Island over the tracks of the Brooklyn, Bath & West End Road, as being in violation of an old agreement. The suit is a result of the competition of the elevated road and the Nassau company for the Summer traffic to Coney Island.

John I. Duffee, of Philadelphia, by Augustus B. Stoughton and Valentine & Brown, attorneys, of Philadelphia, has brought four suits in the United States Circuit Court against the Baltimore Traction Company, the Baltimore, Md., City Passenger Railway Company, the City & Suburban Railway Company and the Central Railway Company, for alleged violation of a patent for a device used on electric railways, granted to William M. Schlesinger, of Philadelphia.

The Cincinnati Inclined Plane Railway Company, known as the Mount Auburn Electric, is arranging to install an underground conduit through the lower part of the city of Cincinnati at once. Mr. H. H. Littell, of Buffalo, N. Y., is the president of this line. A system similar to the underground system adopted by the Metropolitan Street Railway Company, of New York, is to be installed. Citizens of Cincinnati are properly elated over the enterprise and progressiveness of the Mount Auburn road in giving them the latest developments in electric railways.

The Metropolitan Street Railway Association was organized December 26, with the three special objects of disseminating knowledge of the construction and maintenance of street railways, to promote good fellowship among its employés and to aid its members when they are sick. The members of the association are the employés of the Metropolitan Street Railway Company, of New York city. Mr. H. M. Littell, general manager of the company, is president of the association, and takes quite an interest in its objects. The assembly rooms are at 761 Seventh avenue, New York city.

On some of the new monster freight engines, built for the Baltimore & Ohio by the Pittsburgh Locomotive Works, the new Bell spark arrester, invented by Mr. J. Snowden Bell, has been applied. The new arrangement consists of a double perforated deflecting plate, and the disposition of the netting in a series of inclines, with no horizontal surface except a very narrow one on each side of the exhaust pipe. It is said that this arrangement not only prevents the escape of so many live sparks, but it preserves the life of the netting, and is, therefore, more economical and effective than any spark arrester now in use on any other road.

The gross earnings of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., during the year 1896, according to the annual statement just issued, were $4,548,761.41. The operating expenses were $2,236,153.46, the net earnings were $1,912,607 and the surplus this year is $889,605, as against a deficit last year of $706,758. This remarkable improvement is largely due to the falling off in accidents and damage suits, due to the careful management of President Rossiter. The Brooklyn, Queens County & Suburban Railroad reports a deficit of $79,214, as against $.34,156 in 1895.

The want of proper fenders on street cars, as required by law, was the cause of two suits against the Metropolitan Street Railway Company, of Baltimore, Md. One of them was filed by John M. McMillan, who asked for $5,000 because of injuries which he would not have received had there been a proper fender on the car. A similar claim was made by George M. Smith, who sued for $12,000. J. H. Tinker sued the Metropolitan company because the street-car rail was so high above the pavement that he stumbled over it and was hurt. He sues for $5,000. Warren B. Burkhart, son of G. F. Burkhart, sued the company for $3,000. While a car was rounding the curve at Nineteenth and Genessee streets he fell off and broke his leg. Andrew Anderson sued the Metropolitan company for $10,000. He was driving an ice wagon, and because he did not get off the track quick enough, he says the conductor assaulted him and beat him on the head with a metal bell punch.

A Vest-Pocket Polarity Indicator.

The accompanying illustration shows a vest-pocket polarity indicator made by Wood & Comer, 130 Juvenal street, Philadelphia. This firm makes a specialty of manufacturing chemical and scientific apparatus. The increasing encroachment of the electrical and chemical fields has led the firm to place on the market a number of electrical and electro-chemical specialties, among them the indicator shown. This is said to be efficient for currents from one-half to 600 volts. Wood & Comer also make chemical voltameters, apparatus for electrolysis, ozonometers, special delicate thermometers, hydrometers for storage and other batteries and Geissler and Crookes tubes for X-ray work.

A Vest-Pocket Polarity Indicator

He Wanted His Telephone Directory.

A telephone subscriber in a western city, with plenty of time on his hands, requested the manager of his exchange to send him a telephone directory in the following manner:

My Dear Sir:

I hope you are feeling quite well. Mr. Alexander Pope, who, some 150 years ago, had a very pretty reputation as a poet, once wrote these lines:

"Hope springs eternal in the human breast;
Man never is, but always to be, blest."

Mr. Pope was a man of great discernment. If he lived in Chicago, at the corner—let us say—of Polk street and Custom House place, he would probably have been characterized as a man "wid a great head," or "a guy wot's right in de push."

Unfortunately, Mr. Pope did not live in Chicago. The reason why he failed in that desirable distinction is that Chicago had not even been heard of when Mr. Pope died. For Mr. Pope *is* dead—quite dead. He expired some time along about 1740, in the full odor of sanctity, and in the enjoyment of a substantial royalty from the sale of his poems. One of the saddest thoughts that marred the peace of an otherwise typical Christian death-bed was, in fact, the reflection that he would have to leave this royalty behind him. Like most literary men of that age, he had the very deuce of a time squeezing it out of his publishers, for publishers in those days were rapacious, greedy, cruel and unappreciative of true talent. They are, of course, everything that is benevolent, philanthropic and generous now.

Anyhow, as I have said, Mr Pope is dead. This may not be news to you, but you may console yourself with the reflection that all that is true is not new. It is equally certain that all that is new is not true. Therefore, when you have an undoubted truth, even when it is not novel or startling, you have at least the satisfaction of knowing that you are not being misled by specious sophistries or gilded flowers of false rhetoric, to the detriment and disadvantage of your spiritual welfare.

Yes, Mr. Pope is dead. So are Andrew Jackson, Julius Cæsar, James Buchanan, the Siamese Twins, Cato the Censor, Jeff Davis, Marcus Aurelius Antoninus and Old Dog Tray. George Francis Train is not yet dead, but he ought to be.

These few remarks of a preliminary nature bring me to the statement to which I wish to direct your attention: That I myself will be deader than Mr. Pope before you get that telephone directory to my house unless there is some acceleration in the present preparations for sending it. Not to exaggerate, I may say that, from present indications, I do not expect to pore lovingly over that book until about the period of the next World's Fair, say A. D. 2392. Of course, the book will be of no use to me then. *You* can see that. Nearly all the people will be dead or moved away; firm names will be changed; the drainage canal will be finished; the streets will be clean; rents will be low; the Bridgeport stink factories will be closed, and altogether it will be such a heaven on earth that no one would imperil the welfare of his immortal soul by engaging in a wordy warfare with a gum-chewing telephone girl in vain endeavor to get 4-11-44 west—book or no book.

For these and many other reasons (which a pressure of time unfortunately prevents me from stating in full) I hope that you can see your way clear to sending me that book soon. I don't want to hurry a telephone company, of course. I should like to see the man that could. But if it is at all possible, I yearn to gaze on that fascinating yellow-backed volume ere the pansies and marigolds spangle the mud flats of the raging Calumet and the piping of the bullfinch in the tangled thicket heralds the approach of the gladsome Springtide.

Yes, I want that book—that telephone directory. I want it bad. And by my halidom, if I don't get it in the course of soon, I'll write you another letter *sixteen* pages long.

Very truly yours,

P. S.—By the way, the quotation with which I began this letter was meant to express my humble hope that the desired time might finally arrive. I forgot all about it.

A Handsome Calendar.

The Electrical Review has received from the Cutter Electrical and Manufacturing Company, of Philadelphia, an extremely handsome and original calendar. The conventional calendar pad is mounted upon a heavy card, 11 by 14 inches in size, upon which is printed a full detail section drawing in colors of the well known I. T. E. circuit-breaker. The success which the Cutter Company have met with in the past year, in their development of this device, is extraordinary. The range of manufacture is large.

Electro-Chemical Industries.

[*From London Engineering.*]

Those who are interested in following the advancements of electro-chemical science, and who have devoted much attention to the recent English and foreign literature relating to the technical application of electricity, must have been struck by the difficulty of obtaining industrial facts, and by the immense number of mere proposals and patents which come under their notice.

Two recent German books on this subject are filled principally with digests and abstracts of patents, which are none of them being worked on an industrial scale, and journals devoted to this subject fill their pages with the same description of matter. To seek out and separate from amongst all this useless material the actual facts of the electro-chemical and metallurgical industries is a labor demanding much time and an amount of perseverance only to be realized by those attempting it.

In our own country it is regrettable that though great attention has been paid by technologists and chemists to the subject, and though the number of patent claims made during the last 10 years has been exceedingly large, yet to-day the actual production by electrolytic methods of either chemicals or metals is less in Great Britain than in either America or Germany. There are, it is true, a few copper refining works, the most important one being that at Froghall, using electricity as a source of energy; but we can find no published returns of their output, and none of them equal in magnitude some of the American refineries. The electrolytic production of soda and chlorine has, again, not yet reached any magnitude. Only one works, that of the "Electrolytic Soda and Chlorine Trust Syndicate," at Helens, has commenced operations on a large scale, and they have had so many accidents with their turbines and dynamos this year that they have been unable to place much electrolytic soda or bleach upon the market. Hargreaves's process for producing chlorate of soda is working satisfactorily at Northwich, Cheshire. The Castner-Kellner works at Weston Point are progressing, but they have as yet produced no caustic or bleach. If, however, these three processes fulfill all the promises held out in the prospectuses of the companies owning the patent rights, England will rapidly equal, and perhaps surpass, her continental and transatlantic rivals in the production of electrolytic soda and chlorine. As regards the production of aluminum, England has been unfortunate. During the last five years three works have commenced operations, and have been obliged to cease producing, after extremely short runs, owing to the [illegible] fall in price. At present we produce no aluminum, but it is expected that the Falls of Foyers works [illegible] and [illegible] mental scale, but until some use is found for it, other than serving as a mere curiosity and substance for lecture experiments, this branch of electro-metallurgy can not develop.

Turning to France, Germany and Switzerland, we find in these countries a much more flourishing condition of affairs; partly due, no doubt, to their more easily available water power, but also due to their having better trained scientists to carry out the earlier investigations and experimental work. France is producing aluminum at one works situated on the Isère, chlorate of potash at several works in Savoy and calcium carbide in one experimental works in Paris. Germany has caustic potash works at Frankfort, Stassfurt and at Bitterfeld, in Saxony, and the largest aluminum works in the world at Neuhausen. She also possesses copper-refining plants, notably at Hamburg, Oker and Goslar. Switzerland has a very large chlorate of potash manufactory at Valorbes. All of these undertakings appear to be prosperous, since some of them are mere offshoots from other works, and the parent undertaking has in more than one case doubled its own producing capacity in recent years.

In Norway, though up to the present date no actual production of chemicals or metals has taken place, much constructive work is being carried out, and in the near future the syndicates, who have bought up her best situated waterfalls, will be placing both on the market.

Turning now to the States, we find there the most successful development of electro-chemical and electro-metallurgical industries. The electrolytic copper-refining industry has reached what is probably its full development, and unless silver should increase in value, its further expansion is unlikely. The Montana works, with a production of 110 tons per day, and the refining works of the Baltimore Copper Smelting Company, are the most noted, but many others exist, and the whole number in the States can not be far short of 20.

Aluminum is produced by one company only, the Pittsburgh Reduction Company, which has one works at Kensington, near Pittsburgh, and another at Niagara, using 5,000 horse-power from the Falls.

Chlorate of potash is produced by one or two works at the Falls, and caustic soda and chlorine by the Mathieson Alkali Company, at Saltville, Va. There may be other works producing chemicals electrolytically in the States, but as yet no details are forthcoming concerning them. Calcium carbide is also made in small quantities.

A new process, but a most promising one, is the Siemens & Halske gold extraction process. This, though only introduced into South Africa in 1894, is now adopted by eight mining companies, who treat monthly 60,000 [illegible] and [illegible] quite displace the old zinc precipitation process.

This brief review of the electro-chemical and electro-metallurgical industries throughout Europe and America proves that electricity has been applied with great success in many directions. Whether these industries will ultimately group round great centers of water power like Niagara, and Neuhausen on the Rhine, is one of the questions which the future will settle. At present the tendency certainly seems to set in that direction, but it is wise to remember that cheap fuel and nearness to the raw supplies and the market for manufactured products may more than compensate for the absence of water power.

Dr. Perrine and the Chicago School of Electricity.

To the Editor of Electrical Review:

We notice in your issue of December 30 a letter from Prof. Frederick A. C. Perrine, in which he claims that we are using his name in our advertisements, and that such use is not authorized by him. He states: "I have no connection with the Chicago School of Electricity." Will you kindly state in your valuable journal that we have not used and are not using his name in our advertisements, and that we do not purpose so to advertise, as Dr. Perrine has no connection with the Chicago School of Electricity whatsoever?

The lesson leaves, which were prepared for the National School of Electricity, have come into our control by purchase, and we have published them in book form, giving in the descriptive circular the names of the authors, and stating, "published by the Chicago School of Electricity." Dr. Perrine admits in his letter to you that he did assist in preparing the lessons, the only thing we have stated in our advertisements.

No one who was financially interested in the "National School of Electricity" is in any way connected with the Chicago School of Electricity.

There can be no question of bad faith upon the part of the officials of the National School of Electricity, as we, knowing how the lessons were prepared, did not consult them before issuing the bound lesson circular. We sent a copy of this circular to Dr. Perrine, but have not heard from him in reply. * * *

We can refer to every electrical enterprise in this city. We stand entirely upon our own reputation for doing good work, and we do not advertise anything that is not strictly correct. Yours very truly,

Chicago School of Electricity,
R. A. Bagnell, Manager.

Chicago, January 6.

The Cable Must Go!

[*From the New York Sun.*]

The cable-car accident of Tuesday, [illegible] its predecessors, shows that the

PERSONAL.

Mr. George A. McKinlock, president of the Central Electric Company, visited New York city last week, making his headquarters at the Waldorf.

Mr. E. J. Hall, general manager of the American Telephone and Telegraph Company, has been elected president of the Southern Bell Telephone Company.

Capt. E. L. Zalinski, the inventor of the dynamite gun bearing his name, and who is well known in electrical circles, recently arrived in New York city from Europe.

Mr. William Carpenter Camp, vice-president and treasurer of the Metropolitan Electric Company, of Chicago, visited New York city last week and favored the Electrical Review with a call.

Mr. H. B. Thayer, general manager of the Western Electric Company's New York office, is on his way to Japan, where, it is understood, some important electrical contracts are soon to be placed.

Mr. H. D. Fuller, president of the Excelsior Electric Company, after a severe illness that confined him to his house for two weeks, is again able to be at his office, where he is warmly welcomed and congratulated by numerous friends.

Mr. Henry C. Payne, the prominent electric railway man, of Milwaukee, Wis., will, it is said, have a cabinet portfolio under the incoming administration. Mr. Payne, it is believed, will be placed at the head of the Post Office Department.

Commander C. F. Goodrich, U.S.N., was recently transferred to Newport, R. I., to succeed Capt. Henry C. Taylor as president of the Naval War College. Commander Goodrich is thoroughly qualified for the responsible work of this position, and the Electrical Review extends its congratulations to him and to the Naval College.

Mr. John A. Brill, the very popular head and front of the John G. Brill Company, extensive street-car manufacturers, of Philadelphia, is confined to his room with a severe lameness resulting from swelling of the knee. Mr. Brill's acquaintance is world wide, and his friends in all parts of the country will extend most cordial wishes for his early and complete recovery.

Syracuse Storage Battery Company To Be Sold Out.

Leonard H. Groesbeck, receiver of the Syracuse Storage Battery Company, of Syracuse, N. Y., will sell at the company's factory in Phœnix, N. Y., on January 19 all the assets of the company, consisting of tools, electrical apparatus and patents.

The Edison Electric Illuminating Company is having plans drawn for a one-story brick [illegible] power-house,

OUR CANADIAN LETTER.

HULL, QUE.—The Hull Electric Company will put in another dynamo.

GREENWOOD, ONT.—It is probable an electric light plant will shortly be installed here.

SHERBROOKE, QUE.—It is said that the electric railway will not be constructed until next Summer.

PARIS, ONT.—Tenders for lighting the streets by 25 or 30 arc lights are invited. Address S. Dadson, Town Clerk.

VERNON, B. C.—The council propose submitting by-laws for the establishment of water and electric light systems.

CHATHAM, ONT.—The question of installing a civic electric light plant is under consideration by the City Council. The present contract for lighting expires in September, 1897.

BRANTFORD, ONT.—The Board of Trade are considering the question of constructing radial electric railways. Mayor Elliot states that his company propose building a road from Brantford to Ayr, and another from Brantford to Port Dover.

ST. THOMAS, ONT.—The owners of the Berlin Electric Railway are said to be negotiating with Colonel Stacey for the purchase of the street railway in this city. Should the deal be consummated, it is proposed to electrically equip the road.

TORONTO, ONT.—Messrs. Mercier, Bradford & Titus, solicitors, give notice that application will be made to the Ontario Government for incorporation of the Toronto Radial Railway Company, to acquire the franchise of the Toronto Belt Line Railway Company, and to convert the road into an electric railway.

OTTAWA, ONT.—The superintendent of the government telegraph service is preparing for the construction of a government telegraph line from Esquimaux Point towards Belle Isle. Next year it is intended to add about 80 miles of line, which will carry the wires as far as Natishquan, 666 miles below Quebec.

NIAGARA FALLS, ONT.—The dispute between the directors of the Niagara Central Railway Company is likely to be satisfactorily settled, when a movement will be made to introduce a suburban service from St. Catharines to Niagara Falls. This service will necessitate the rebuilding of the road and repairing the present rolling stock. Plans for the scheme are already being considered, and the work will probably commence about the beginning of the year.

MONTREAL, QUE.—Tate's old sawmill, Mill street, is now being converted into a power-house for lighting the Lachine Canal. The old wooden structure, just opposite, which was erected for this purpose some years ago, is considered too small to accommodate the large plant necessitated by the increased number of arc lights. Large turbine water-wheels are now being put in their respective places ready for use in the Spring. The work is in charge of

New York Electrical Society.

The next meeting of the society will be held at Columbia College on Thursday, January 14, at 8 P. M. Mr. E. Leavenworth Elliott will give a paper on "Light; Its Distribution and Diffusion as Related to Quality and Efficiency."

The recent great advances in the economical production of gas and electricity have suggested in its turn the desirability of better means for the distribution and diffusion of the light when manufactured, an aspect of the light problem that has hitherto been, to a great extent, neglected. Mr. Elliott's paper is directed to the discussion of the means for making the light-giving element most effective. It will be illustrated with diagrams and apparatus bearing directly on the question.

A Telephone Patent Decision.

In the suit brought in the United States Circuit Court, of Maryland, of A. G. Davis vs. Chesapeake & Potomac Telephone Company for infringement of patent No. 223,968, granted to J. H. C. Watts, the court has rendered a decision in favor of the plaintiff and held that the switchboard pin used by the Chesapeake & Potomac Telephone Company in its exchanges in Baltimore and Washington, D. C., is an infringement on the Watts patent. Mr. Davis is president of the Viaduct Manufacturing Company, owners of the Watts patent. The case was virtually one between the Viaduct company and the Western Electric Company, in which the Viaduct company won.

New Discoveries of Platinum.

A Paris paper states that small veins carrying platinum have recently been found in syenitic rocks in Hungary. Platinum has also been found in veins of manganese ore existing in altered or decomposed syenites near Santa Rosa de Osos, in Colombia, South America.

American Electric Telephone Company.

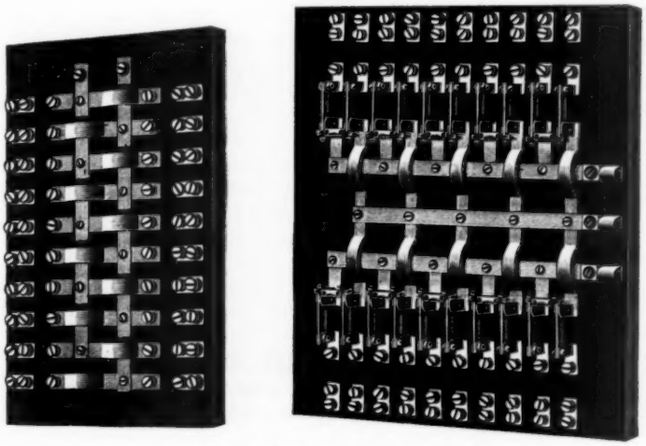
The American Electric Telephone Company, of Kokomo, Ind., has recently largely increased its factory facilities and is now in a better position than ever to turn out promptly

A New and Improved Panel Board.

We illustrate on this page a new panel board, manufactured by J. Jones & Son, of New York, in which are combined good quality of workmanship, carrying capacity and neatness, with low cost. The cost is reduced to a minimum by the peculiar feature of having the branch circuits jump the main bars to the points where contacts are desired, the two surfaces, that of main and branch circuits, being held together and to the base by the same screw. Heretofore the general usage has been to raise the mains, the branches being mounted on the slate, contact with the main being made by blocks between the surfaces of the mains and branches at the points desired.

This method is costly and requires considerable exactness to make a good, neat mechanical piece of work. The mounting of this class of work also requires considerably more labor.

The contact surfaces in the Jones product are reduced to two (the minimum), therefore a reduction in resistance and, necessarily, better conductivity at these points in consequence. Copper only is used in this new panel.



J. JONES & SON'S NEW PANEL BOARD.

The switch handle is on the top and is a part of the cross-bar between the blades, being a position where it can do best service and at the same time be away from the surfaces carrying current. Heretofore this has been attempted by slanting the handles, but does not meet the requirements.

The switches are made to make best contacts, all the working parts being mechanically perfect, and the surfaces fitting with exactness.

Electric Separators in Mining.

A special from Allentown, Pa., to the Philadelphia *Ledger* says that Thomas A. Edison, with several prominent iron men, was in that city recently. He has been at Catasauqua for several days making a series of experiments at the Crane Iron Works. This company lately purchased about 1,500 tons of briquettes from the Edison mines, near Lake Hopatcong. These briquettes weigh about a pound or so, and consist of ore compressed into a circular-shaped disk.

separator the ore is extracted from the rock, which has been reduced to a powder. The ore is called a "concentrate," and out of 5,000 tons of ground rock the result is about 250 tons of concentrate. This concentrate contains about 60 to 65 per cent of pure ore.

This week the Crane Iron Company commenced testing the ore, and Mr. Edison, accompanied by one of his assistants, Frederick Ott, is anxiously watching the result of the tests. Should the ore be all that is claimed for it, this new method of mining will revolutionize the present method, particularly in regard to the low grades of ore found on the Lehigh Mountains. The leanest kind of ore can be worked at a profit under the Edison method.

Union Traction Company Not Sold.

President H. C. Adams, of the Union Traction Company, of Rutherford, N. J., informs the ELECTRICAL REVIEW that the recent reports to the effect that the Consolidated Traction Company, of New Jersey, had purchased his road are untrue. The Union Traction Company has not been sold to any one.

KIND WORDS.

"HIGHLY PLEASED."

TO THE EDITOR OF ELECTRICAL REVIEW:

Must say that I am highly pleased with your paper and do not care to be without it. I wish it all success in the future.

Yours very truly,

GEORGE W. CLAPP.

January 8.

New York and St. Augustine.

One thousand miles in less than 28 hours! From Winter to Summer in a day's luxurious journey! From snow to the tropical palm in a day, with the fatigue of traveling having been rendered almost impossible by the wonderful management of one of the world's most progressive railroads. It sounds like an impossibility—a leaf from a fairy tale—but that is what the Winter schedule of the Southern Railroad Company means. Leave New York at noon to day, and tomorrow afternoon, at 4.40, you step off this superb Limited Pullman Vestibuled train at St. Augustine in a garden of flowers, and within view of the most beautiful hotels on this continent. You have seen in that marvelous trip between New York and Florida 1,000 miles of panoramic scenery—swiftly shifting changes of people and climate. As long as you live, that trip, with its scenes and experience on the finest train this country has yet produced, will be indelibly impressed on your memory.

An additional Pullman Drawing-Room Sleeping Car is attached to the New York & Florida Limited, and is operated between New York and Augusta, making close connection at Trenton, within a few minutes' ride of Ashe- [illegible]

INCANDESCENT LAMP FILAMENTS.

THEIR VALUE AND USE—EDISON'S FIRST EXPERIMENTS—THE REDUCED PRICE OF INCANDESCENT LAMPS AND THE GREAT NUMBER CONSUMED ANNUALLY.

We publish below part of an interesting article that recently appeared in the daily *Sun* of this city. It was evidently inspired by an editorial note in the ELECTRICAL REVIEW calling attention to the great value of a pound of incandescent lamp filaments, and the subject is handled with a degree of accuracy and understanding that is often lacking in the lay press when treating of technical subjects:

Somebody writing in a technical newspaper recently directed attention to the enormous value which these filaments have when estimated by the pound avoirdupois, and a *Sun* reporter went to the lamp works of the General Electric Company at Harrison, N. J., to look into this interesting subject. Superintendent Eyre became interested in this view of the subject at once, although it was not a new one to him, and, summoning some of his department assistants, he made, with their help, some very interesting calculations.

The standard lamp for general use is of 16 candle-power. Out of the 20,000,000 electric lamps used every year in the world this size is believed to number 90 per cent. A carbon filament for that sized lamp measures $\frac{1}{1000}$ of an inch in diameter and 10 inches in length, and 200 of these put upon a scale weighed 10 grains. Mr. Eyre's calculations soon demonstrated that, with 7,000 grains to the pound avoirdupois, it would take 140,000 of these filaments to make a pound, and that at the current market rate for these, $10 a thousand, their value would be $1,400. A man can carry 150 pounds in a sack on his back, and if the sack were filled with such bits of carbon his load would be worth $210,000.

Take but a single pound of these filaments and stretch them out in a continuous straight line, and they would cover a space of 113,333 feet, or about 21.3 miles. The world's product for the year would reach 3,157 miles, and in a little more than seven years, at the present rate, would reach completely around the globe.

But the value of the filament of this size is small when compared with that of some for the smallest of the lamps made. Whether a filament be for large or small lamps, it costs about the same sum to the market, but its candle-power makes a great difference in its size and weight. The smallest of the incandescent lamps used for regular purposes is of three candle-power. For this the filament is of a plain U shape, and is $\frac{6}{1000}$ of an inch in diameter and ⅜ of an inch long. Mr. Eyre's calculations showed that there would be 1,000,000 of these to a pound, and these would be worth $10,000. But, again, the lamp makers manufacture many tiny lamps for surgical and dental uses. The smallest of these is called the pea lamp. Its tiny bulb is about one-fourth of an inch in diameter, and physicians use it at the end of probes and similar instruments to illuminate the interior of the human body. Its carbon filament is but $\frac{2}{1000}$ of an inch in diameter and but one-eighth of an inch long. This is but the 320th part of the volume of the 16-candle-power filament, and, as a consequence, it was easily figured that it would take 44,800,000 of these to make a pound, and their value would be $448,000.

"Whew!" said Mr. Eyre, when he had verified his figures. "I did not know that we had anything so valuable about the factory. I think some time I will have to walk off with a pound of these."

The head of the filament department laughed. "Where would you get them?" he asked. "In the whole history of this factory we never made anything like a pound of them, and if we had, where would you sell them?"

"Well, an ounce would do," said Mr. Eyre.

Of course, the larger the filaments are the less they are worth by weight, but whether they are of a value of $1,400 a pound or $448,000, it is interesting to consider that practically all of this value is the product of human labor and skill. The material out of which they are produced costs but a few cents. Their history and the way in which they are produced are known to but few except those who are intimately associated with their production.

In the early days of experimenting with the electric light the current was passed through a thin wire of platinum. The reader may remember at that time Mr. Edison had agents looking all over the world for new sources of supply of that rare metal. Then, as now, nearly all the platinum of the world came from two districts in the Ural Mountains in Siberia. Had the people remained dependent upon platinum for their lamps they would have needed for each one a piece of wire $\frac{6}{1000}$ of an inch in diameter and 15 inches long, and this at the present price of platinum—$13 an ounce—would cost 10 cents. The world's whole product of this metal in 1887 was but about 9,500 pounds, and would have been inadequate for the present lamp supply. Even to-day, with a product of perhaps 12,000 or 13,000 pounds, there would be but a small margin left after making 20,000,000 lamps, and merely the cost of the filaments would be $2,000,000. It was at this juncture that Edison conceived the idea of using a carbon filament. He confided his idea to his chief assistant, Mr. Batchellor, and they began work one evening. It is one of Edison's peculiarities that, once started upon a piece of work, he does not stop for sleep or sometimes even food. The material from which he proposed to make his filament was a spool of Clark's cotton thread. All that night Edison and Batchellor worked and all the next day, and then again all night. At the end of 36 hours they had produced a perfect filament. Mr. Batchellor took it up and they marched with it toward the bench where a glass-blower was at work. Just as they reached the bench the carbon broke. "Edison," cried Batchellor, "we won't sleep until we make one." Back they went to work, and late in the afternoon they completed a second carbon loop. Again they marched with it to the glass-blower's bench and placed it there in safety, but just then a jeweler's screwdriver rolled over it and broke it. Batchellor was an even-tempered man, but that was too much.

"I'm damned!" he cried. "Job got too much reputation for patience on a small capital."

There was no giving up, however. Back to work the two men went. Experience had been a good teacher, and before night they had completed a third filament, got it safely mounted in a bulb, exhausted the air and set it glowing with the electric current.

For the great illumination at Menlo Park, which followed, the filaments were made of pieces stamped out of visiting cards, and many after that were stamped from paper. Others were made from slivers of bamboo. Weston was the first, perhaps, to use vegetable parchment for the purpose, but that is what the General Electric Company use today. This is virtually the material out of which artificial silk is made. Just the materials and process used no filament maker will tell, for this is one of the last of the trade secrets, and the only one about lamp making. A mixture of vegetable matter, rich in carbon, like paper stock or cotton, is taken and is digested with sulphuric acid or chlorides until it is a gummy mass about as thick as dough. This is forced through dies, just as vermicelli is made, and it comes out in endless strings. For 16-candle-power filaments the die has an aperture $\frac{22}{1000}$ of an inch in diameter. The string of paste falls into a jar partly filled with a secret liquid, where it lies in coils. Then it is run out, washed and partly dried and coiled on cylinders to become entirely dry. Then it is cut into proper lengths, with allowance for shrinkage, and taken in bunches and wound on shapers to give it the form desired and set into form by being heated slightly. Now it is ready for carbonizing. This is done by packing the bunches in crucibles with sifted charcoal or other carboniferous substances, and, after sealing, by baking it in a hot fire for one and one-half day. When it is taken out every thread is black and shiny and seems to have a perfect surface, but it is not ready for use. Now each filament is taken separately and clamped with each end in a live electric current, and while it is immersed in a vapor of gasoline the current is passed through it. The effect is to deposit upon the white-hot filament a coating of lamp-black, or carbonized gasoline, which gives it qualities not otherwise obtainable. In the early days of their manufacture only eight 16-candle-power lamps could be lit by one horse-power, but now 15 are used. The filament is now ready to be mounted in the lamp.

There are 30 lamp factories in the United States. Only about half of these make their own filaments. The others buy them from special manufacturers. One of the largest of these filament makers is in Newark, N. J. All the lamp factories in the United States produce altogether about 11,000,000 lamps a year. Of this product, 6,000,000 are turned out at the factory of the General Electric Company at Harrison.

Unlike those fragile filaments which Edison produced, the new ones are handled easily, and although they break easily when bent sharply, they are so springy that they can be drawn straight out without danger and then allowed to fly back to shape.

With the development of the carbon filament has come a gradual change in all the processes of lamp making, until the price of 16-candle-power lights has fallen gradually from $1.25 each to 20 cents, or even a trifle less when taken by contract in large lots.

Huntress & Ewing.

Messrs. F. E. Huntress and George C. Ewing have formed the firm of Huntress & Ewing, with offices at 8 Oliver street, Boston, Mass., to deal in electric railway equipments of all kinds, motors and dynamos, new and second-hand. Mr. Ewing has been for some time in the same line of business at 620 Atlantic avenue, Boston. His new connections will give him increased facilities for handling orders promptly and satisfactorily.

A New Electric Railway Line Opened in Pittsburgh.

A few days ago a new electric railroad, called the Hilltop line, was opened in Pittsburgh. The Hilltop line is a branch of the Pittsburgh & Birmingham Traction Company, which connects the old city of Pittsburgh with those districts situated on the southern shore of the Monongahela River. The Hilltop line runs across the Monongahela over the Smithfield street bridge and goes up Brownsville avenue, which road has a grade of 15 per cent. By this road the suburb of Knoxville is reached. The line has been in great demand because it will afford rapid-transit facilities to about 50,000 people who have hitherto been entirely dependent upon inclines and such walking accommodations as unpaved streets afforded.

The Birmingham Traction Company operates 22 cars on the Hilltop line. The cars are equipped with two 50-horse-power Westinghouse motors and controllers. To take care of the increased traffic occasioned by the opening of this line, the Birmingham Traction Company has recently remodeled and re-equipped its power-house at Thirty-first and Carson streets. This power-house was equipped with generators of an older make. They have all been thrown out and three 700-kilowatt Westinghouse generators have been substituted.

LITERARY.

We have received from Mr. Nicholas S. Hill, Jr., city engineer of Baltimore, Md., a copy of "Report of the Electrical Commission of Baltimore City to the Mayor and City Council on a General Subway System to be Owned by the City of Baltimore."

Poultney Bigelow in the *North American Review* for January enters into the subject of "The German Press and the United States," presenting with keen insight the several causes which make us at present the target for Prussian press malevolence.

The *Inland Printer* for January provides a table of contents of admirable variety and interest. The exploiting of all that is new in the art of printing and engraving is the special field of this publication, which ranks at the head of American trade journals. The beauty of its workmanship is unparalleled. Two dollars per year, 20 cents per copy. The Inland Printer Company, Chicago.

The 18th annual number of the *Tradesman*, published at Chattanooga, Tenn., contains over 260 pages and presents the most complete, exhaustive and valuable review of the South, its resources, development and possibilities, that to our knowledge has ever been published. The special articles are from leading thinkers, statisticians and business men, and the information given is the result of careful investigation and practical knowledge.

Electric Railways.

The electric street railway property at Savannah, Ga., was sold by auction on January 5, for $210,000, to a syndicate of New York bondholders.

The car barns and engine-house of the Raleigh, N. C., Electric Street Railway was destroyed by fire. The loss is $50,000, The plant is to be rebuilt at once.

The Buffalo & Niagara Falls, N. Y., Electric Railway Company has appealed to the appellate division of the Supreme Court from a verdict of $1,069.83, secured against the company by Dominick Greiser, a Tonawanda saloon-keeper, for damages.

The Cincinnati, Ohio, Newport & Covington system has passed into the hands of a new board of directors. The general offices will be removed from Cleveland to Cincinnati. The new board is guaranteed control for two years. A contract was concluded with a syndicate to take $500,000 second-mortgage bonds at 70 per cent and accrued interest.

A resolution to issue $150,000 of first preferred six per cent gold bonds has been adopted by the reorganization committee of the Dallas, Tex., Consolidated Street Railway Company. The proceeds will be used in changing the lines of the company to electric power. The reorganization committee is composed of Messrs. John Gill, William H. Blackford, J. Wilcox Brown, Douglas H. Gordon and Harry Jenkins.

Trial has commenced before Judge Dickey of the suit brought by the Brooklyn, N. Y., Elevated Road to restrain the Nassau Electric Road from carrying passengers for a single fare of five cents from the city to Coney Island over the tracks of the Brooklyn, Bath & West End Road, as being in violation of an old agreement. The suit is a result of the competition of the elevated road and the Nassau company for the Summer traffic to Coney Island.

John I. Duffee, of Philadelphia, by Augustus B. Stoughton and Valentine & Brown, attorneys, of Philadelphia, has brought four suits in the United States Circuit Court against the Baltimore Traction Company, the Baltimore, Md., City Passenger Railway Company, the City & Suburban Railway Company and the Central Railway Company, for alleged violation of a patent for a device used on electric railways, granted to William M. Schlesinger, of Philadelphia.

The Cincinnati Inclined Plane Railway Company, known as the Mount Auburn Electric, is arranging to install an underground conduit through the lower part of the city of Cincinnati at once. Mr. H. H. Littell, of Buffalo, N. Y., is the president of this line. A system similar to the underground system adopted by the Metropolitan Street Railway Company, of New York, is to be installed. Citizens of Cincinnati are properly elated over the enterprise and progressiveness of the Mount Auburn road in giving them the latest developments in electric railways.

The Metropolitan Street Railway Association was organized December 26, with the three special objects of disseminating knowledge of the construction and maintenance of street railways, to promote good fellowship among its employés and to aid its members when they are sick. The members of the association are the employés of the Metropolitan Street Railway Company, of New York city. Mr. H. M. Littell, general manager of the company, is president of the association, and takes quite an interest in its objects. The assembly rooms are at 761 Seventh avenue, New York city.

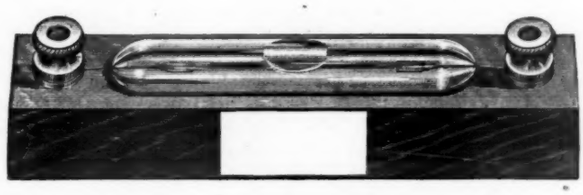
On some of the new monster freight engines, built for the Baltimore & Ohio by the Pittsburgh Locomotive Works, the new Bell spark arrester, invented by Mr. J. Snowden Bell, has been applied. The new arrangement consists of a double perforated deflecting plate, and the disposition of the netting in a series of inclines, with no horizontal surface except a very narrow one on each side of the exhaust pipe. It is said that this arrangement not only prevents the escape of so many live sparks, but it preserves the life of the netting, and is, therefore, more economical and effective than any spark arrester now in use on any other road.

The gross earnings of the Brooklyn Heights Railroad Company, of Brooklyn, N. Y., during the year 1896, according to the annual statement just issued, were $4,548,761.41. The operating expenses were $2,236,153.46, the net earnings were $1,912,607 and the surplus this year is $89,605, as against a deficit last year of $706,758. This remarkable improvement is largely due to the falling off in accidents and damage suits, due to the careful management of President Rossiter. The Brooklyn, Queens County & Suburban Railroad reports a deficit of $79,214, as against $.34,156 in 1895.

The want of proper fenders on street cars, as required by law, was the cause of two suits against the Metropolitan Street Railway Company, of Baltimore, Md. One of them was filed by John M. McMillan, who asked for $5,000 because of injuries which he would not have received had there been a proper fender on the car. A similar claim was made by George M. Smith, who sued for $12,000. J. H. Tinker sued the Metropolitan company because the street-car rail was so high above the pavement that he stumbled over it and was hurt. He sues for $5,000. Warren B. Burkhart, son of G. F. Burkhart, sued the company for $3,000. While a car was rounding the curve at Nineteenth and Genessee streets he fell off and broke his leg. Andrew Anderson sued the Metropolitan company for $10,000. He was driving an ice wagon, and because he did not get off the track quick enough, he says the conductor assaulted him and beat him on the head with a metal bell punch.

A Vest-Pocket Polarity Indicator.

The accompanying illustration shows a vest-pocket polarity indicator made by Wood & Comer, 130 Juvenal street, Philadelphia. This firm makes a specialty of manufacturing chemical and scientific apparatus. The increasing encroachment of the electrical and chemical fields has led the firm to place on the market a number of electrical and electro-chemical specialties, among them the indicator shown. This is said to be efficient for currents from one-half to 600 volts. Wood & Comer also make chemical voltameters, apparatus for electrolysis, ozonometers, special delicate thermometers, hydrometers for storage and other batteries and Geissler and Crookes tubes for X-ray work.



A Vest-Pocket Polarity Indicator

He Wanted His Telephone Directory.

A telephone subscriber in a western city, with plenty of time on his hands, requested the manager of his exchange to send him a telephone directory in the following manner:

My Dear Sir:

I hope you are feeling quite well. Mr. Alexander Pope, who, some 150 years ago, had a very pretty reputation as a poet, once wrote these lines:

"Hope springs eternal in the human breast;
Man never is, but always to be, blest."

Mr. Pope was a man of great discernment. If he lived in Chicago, at the corner—let us say—of Polk street and Custom House place, he would probably have been characterized as a man "wid a great head," or "a guy wot's right in de push."

Unfortunately, Mr. Pope did not live in Chicago. The reason why he failed in that desirable distinction is that Chicago had not even been heard of when Mr. Pope died. For Mr. Pope *is* dead—quite dead. He expired some time along about 1740, in the full odor of sanctity, and in the enjoyment of a substantial royalty from the sale of his poems. One of the saddest thoughts that marred the peace of an otherwise typical Christian death-bed was, in fact, the reflection that he would have to leave this royalty behind him. Like most literary men of that age, he had the very deuce of a time squeezing it out of his publishers, for publishers in those days were rapacious, greedy, cruel and unappreciative of true talent. They are, of course, everything that is benevolent, philanthropic and generous now.

Anyhow, as I have said, Mr Pope is dead. This may not be news to you, but you may console yourself with the reflection that all that is true is not new. It is equally certain that all that is new is not true. Therefore, when you have an undoubted truth, even when it is not novel or startling, you have at least the satisfaction of knowing that you are not being misled by specious sophistries or gilded flowers of false rhetoric, to the detriment and disadvantage of your spiritual welfare.

Yes, Mr. Pope is dead. So are Andrew Jackson, Julius Cæsar, James Buchanan, the Siamese Twins, Cato the Censor, Jeff Davis, Marcus Aurelius Antoninus and Old Dog Tray. George Francis Train is not yet dead, but he ought to be.

These few remarks of a preliminary nature bring me to the statement to which I wish to direct your attention: That I myself will be deader than Mr. Pope before you get that telephone directory to my house unless there is some acceleration in the present preparations for sending it. Not to exaggerate, I may say that, from present indications, I do not expect to pore lovingly over that book until about the period of the next World's Fair, say A. D. 2392. Of course, the book will be of no use to me then. *You* can see that. Nearly all the people will be dead or moved away; firm names will be changed; the drainage canal will be finished; the streets will be clean; rents will be low; the Bridgeport stink factories will be closed, and altogether it will be such a heaven on earth that no one would imperil the welfare of his immortal soul by engaging in a wordy warfare with a gum-chewing telephone girl in vain endeavor to get 4-11-44 west—book or no book.

For these and many other reasons (which a pressure of time unfortunately prevents me from stating in full) I hope that you can see your way clear to sending me that book soon. I don't want to hurry a telephone company, of course. I should like to see the man that could. But if it is at all possible, I yearn to gaze on that fascinating yellow-backed volume ere the pansies and marigolds spangle the mud flats of the raging Calumet and the piping of the bullfinch in the tangled thicket heralds the approach of the gladsome Springtide.

Yes, I want that book—that telephone directory. I want it bad. And by my halidom, if I don't get it in the course of soon, I'll write you another letter *sixteen* pages long.

Very truly yours,

P. S.—By the way, the quotation with which I began this letter was meant to express my humble hope that the desired time might finally arrive. I forgot all about it.

A Handsome Calendar.

The Electrical Review has received from the Cutter Electrical and Manufacturing Company, of Philadelphia, an extremely handsome and original calendar. The conventional calendar pad is mounted upon a heavy card, 11 by 14 inches in size, upon which is printed a full detail section drawing in colors of the well known I. T. E. circuit-breaker. The success which the Cutter Company have met with in the past year, in their development of this device, is extraordinary. The range of manufacture is large.

Electro-Chemical Industries.

[*From London Engineering.*]

Those who are interested in following the advancements of electro-chemical science, and who have devoted much attention to the recent English and foreign literature relating to the technical application of electricity, must have been struck by the difficulty of obtaining industrial facts, and by the immense number of mere proposals and patents which come under their notice.

Two recent German books on this subject are filled principally with digests and abstracts of patents, which are none of them being worked on an industrial scale, and journals devoted to this subject fill their pages with the same description of matter. To seek out and separate from amongst all this useless material the actual facts of the electro-chemical and metallurgical industries is a labor demanding much time and an amount of perseverance only to be realized by those attempting it.

In our own country it is regrettable that though great attention has been paid by technologists and chemists to the subject, and though the number of patent claims made during the last 10 years has been exceedingly large, yet to-day the actual production by electrolytic methods of either chemicals or metals is less in Great Britain than in either America or Germany. There are, it is true, a few copper refining works, the most important one being that at Froghall, using electricity as a source of energy; but we can find no published returns of their output, and none of them equal in magnitude some of the American refineries. The electrolytic production of soda and chlorine has, again, not yet reached any magnitude. Only one works, that of the "Electrolytic Soda and Chlorine Trust Syndicate," at Helens, has commenced operations on a large scale, and they have had so many accidents with their turbines and dynamos this year that they have been unable to place much electrolytic soda or bleach upon the market. Hargreaves's process for producing chlorate of soda is working satisfactorily at Northwich, Cheshire. The Castner-Kellner works at Weston Point are progressing, but they have as yet produced no caustic or bleach. If, however, these three processes fulfill all the promises held out in the prospectuses of the companies owning the patent rights, England will rapidly equal, and perhaps surpass, her continental and transatlantic rivals in the production of electrolytic soda and chlorine. As regards the production of aluminum, England has been unfortunate. During the last five years three works have commenced operations, and have been obliged to cease producing, after extremely short runs, owing to the rapid fall in prices. At present we produce no aluminum, but it is expected that the Falls of Foyers works will be in operation next year. During this year calcium carbide has been produced at these works by the Acetylene Gas Company on an experimental scale, but until some use is found for it, other than serving as a mere curiosity and substance for lecture experiments, this branch of electro-metallurgy can not develop.

Turning to France, Germany and Switzerland, we find in these countries a much more flourishing condition of affairs; partly due, no doubt, to their more easily available water power, but also due to their having better trained scientists to carry out the earlier investigations and experimental work. France is producing aluminum at one works situated on the Isère, chlorate of potash at several works in Savoy and calcium carbide in one experimental works in Paris. Germany has caustic potash works at Frankfort, Stassfurt and at Bitterfeld, in Saxony, and the largest aluminum works in the world at Neuhausen. She also possesses copper-refining plants, notably at Hamburg, Oker and Goslar. Switzerland has a very large chlorate of potash manufactory at Valorbes. All of these undertakings appear to be prosperous, since some of them are mere offshoots from other works, and the parent undertaking has in more than one case doubled its own producing capacity in recent years.

In Norway, though up to the present date no actual production of chemicals or metals has taken place, much constructive work is being carried out, and in the near future the syndicates, who have bought up her best situated waterfalls, will be placing both on the market.

Turning now to the States, we find there the most successful development of electro-chemical and electro-metallurgical industries. The electrolytic copper-refining industry has reached what is probably its full development, and unless silver should increase in value, its further expansion is unlikely. The Montana works, with a production of 110 tons per day, and the refining works of the Baltimore Copper Smelting Company, are the most noted, but many others exist, and the whole number in the States can not be far short of 20.

Aluminum is produced by one company only, the Pittsburgh Reduction Company, which has one works at Kensington, near Pittsburgh, and another at Niagara, using 5,000 horse-power from the Falls.

Chlorate of potash is produced by one or two works at the Falls, and caustic soda and chlorine by the Mathieson Alkali Company, at Saltville, Va. There may be other works producing chemicals electrolytically in the States, but as yet no details are forthcoming concerning them. Calcium carbide is also made in small quantities.

A new process, but a most promising one, is the Siemens & Halske gold extraction process. This, though only introduced into South Africa in 1894, is now adopted by eight mining companies, who treat monthly 60,000 tons of tailings and recover the gold from the cyanide by an electrolytic method. It is quite possible that this process, and other similar ones, may quite displace the old zinc precipitation process.

This brief review of the electro-chemical and electro-metallurgical industries throughout Europe and America proves that electricity has been applied with great success in many directions. Whether these industries will ultimately group round great centers of water power like Niagara, and Neuhausen on the Rhine, is one of the questions which the future will settle. At present the tendency certainly seems to set in that direction, but it is wise to remember that cheap fuel and nearness to the raw supplies and the market for manufactured products may more than compensate for the absence of water power.

Dr. Perrine and the Chicago School of Electricity.

To the Editor of Electrical Review:

We notice in your issue of December 30 a letter from Prof. Frederick A. C. Perrine, in which he claims that we are using his name in our advertisements, and that such use is not authorized by him. He states: "I have no connection with the Chicago School of Electricity." Will you kindly state in your valuable journal that we have not used and are not using his name in our advertisements, and that we do not purpose so to advertise, as Dr. Perrine has no connection with the Chicago School of Electricity whatsoever?

The lesson leaves, which were prepared for the National School of Electricity, have come into our control by purchase, and we have published them in book form, giving in the descriptive circular the names of the authors, and stating, "published by the Chicago School of Electricity." Dr. Perrine admits in his letter to you that he did assist in preparing the lessons, the only thing we have stated in our advertisements.

No one who was financially interested in the "National School of Electricity" is in any way connected with the Chicago School of Electricity.

There can be no question of bad faith upon the part of the officials of the National School of Electricity, as we, knowing how the lessons were prepared, did not consult them before issuing the bound lesson circular. We sent a copy of this circular to Dr. Perrine, but have not heard from him in reply. * * *

We can refer to every electrical enterprise in this city. We stand entirely upon our own reputation for doing good work, and we do not advertise anything that is not strictly correct. Yours very truly,

Chicago School of Electricity,
R. A. Bagnell, Manager.

Chicago, January 6.

The Cable Must Go!

[*From the New York Sun.*]

The cable-car accident of Tuesday, like its predecessors, shows that the cable ought to go. Let us have electricity, or compressed air, or something else; but not the cable.

PERSONAL.

Mr. George A. McKinlock, president of the Central Electric Company, visited New York city last week, making his headquarters at the Waldorf.

Mr. E. J. Hall, general manager of the American Telephone and Telegraph Company, has been elected president of the Southern Bell Telephone Company.

Capt. E. L. Zalinski, the inventor of the dynamite gun bearing his name, and who is well known in electrical circles, recently arrived in New York city from Europe.

Mr. William Carpenter Camp, vice-president and treasurer of the Metropolitan Electric Company, of Chicago, visited New York city last week and favored the Electrical Review with a call.

Mr. H. B. Thayer, general manager of the Western Electric Company's New York office, is on his way to Japan, where, it is understood, some important electrical contracts are soon to be placed.

Mr. H. D. Fuller, president of the Excelsior Electric Company, after a severe illness that confined him to his house for two weeks, is again able to be at his office, where he is warmly welcomed and congratulated by numerous friends.

Mr. Henry C. Payne, the prominent electric railway man, of Milwaukee, Wis., will, it is said, have a cabinet portfolio under the incoming administration. Mr. Payne, it is believed, will be placed at the head of the Post Office Department.

Commander C. F. Goodrich, U.S.N., was recently transferred to Newport, R. I., to succeed Capt. Henry C. Taylor as president of the Naval War College. Commander Goodrich is thoroughly qualified for the responsible work of this position, and the Electrical Review extends its congratulations to him and to the Naval College.

Mr. John A. Brill, the very popular head and front of the John G. Brill Company, extensive street-car manufacturers, of Philadelphia, is confined to his room with a severe lameness resulting from swelling of the knee. Mr. Brill's acquaintance is world wide, and his friends in all parts of the country will extend most cordial wishes for his early and complete recovery.

Syracuse Storage Battery Company To Be Sold Out.

Leonard H. Groesbeck, receiver of the Syracuse Storage Battery Company, of Syracuse, N. Y., will sell at the company's factory in Phœnix, N. Y., on January 19 all the assets of the company, consisting of tools, electrical apparatus and patents.

The Edison Electric Illuminating Company is having plans drawn for a one-story brick and iron power-house, to be erected at the foot of Sixty-ninth street, Brooklyn, N. Y., at a cost of $300,000.

OUR CANADIAN LETTER.

HULL, QUE.—The Hull Electric Company will put in another dynamo.

GREENWOOD, ONT.—It is probable an electric light plant will shortly be installed here.

SHERBROOKE, QUE.—It is said that the electric railway will not be constructed until next Summer.

PARIS, ONT.—Tenders for lighting the streets by 25 or 30 arc lights are invited. Address S. Dadson, Town Clerk.

VERNON, B. C.—The council propose submitting by-laws for the establishment of water and electric light systems.

CHATHAM, ONT.—The question of installing a civic electric light plant is under consideration by the City Council. The present contract for lighting expires in September, 1897.

BRANTFORD, ONT.—The Board of Trade are considering the question of constructing radial electric railways. Mayor Elliot states that his company propose building a road from Brantford to Ayr, and another from Brantford to Port Dover.

ST. THOMAS, ONT.—The owners of the Berlin Electric Railway are said to be negotiating with Colonel Stacey for the purchase of the street railway in this city. Should the deal be consummated, it is proposed to electrically equip the road.

TORONTO, ONT.—Messrs. Mercier, Bradford & Titus, solicitors, give notice that application will be made to the Ontario Government for incorporation of the Toronto Radial Railway Company, to acquire the franchise of the Toronto Belt Line Railway Company, and to convert the road into an electric railway.

OTTAWA, ONT.—The superintendent of the government telegraph service is preparing for the construction of a government telegraph line from Esquimaux Point towards Belle Isle. Next year it is intended to add about 80 miles of line, which will carry the wires as far as Natishquan, 666 miles below Quebec.

NIAGARA FALLS, ONT.—The dispute between the directors of the Niagara Central Railway Company is likely to be satisfactorily settled, when a movement will be made to introduce a suburban service from St. Catharines to Niagara Falls. This service will necessitate the rebuilding of the road and repairing the present rolling stock. Plans for the scheme are already being considered, and the work will probably commence about the beginning of the year.

MONTREAL, QUE.—Tate's old sawmill, Mill street, is now being converted into a power-house for lighting the Lachine Canal. The old wooden structure, just opposite, which was erected for this purpose some years ago, is considered too small to accommodate the large plant necessitated by the increased number of arc lights. Large turbine waterwheels are now being put in their respective places ready for use in the Spring. The work is in charge of government employés. J. A. C.

Montreal, January 9.

New York Electrical Society.

The next meeting of the society will be held at Columbia College on Thursday, January 14, at 8 P. M. Mr. E. Leavenworth Elliott will give a paper on "Light; Its Distribution and Diffusion as Related to Quality and Efficiency."

The recent great advances in the economical production of gas and electricity have suggested in its turn the desirability of better means for the distribution and diffusion of the light when manufactured, an aspect of the light problem that has hitherto been, to a great extent, neglected. Mr. Elliott's paper is directed to the discussion of the means for making the light-giving element most effective. It will be illustrated with diagrams and apparatus bearing directly on the question.

A Telephone Patent Decision.

In the suit brought in the United States Circuit Court, of Maryland, of A. G. Davis vs. Chesapeake & Potomac Telephone Company for infringement of patent No. 223,968, granted to J. H. C. Watts, the court has rendered a decision in favor of the plaintiff and held that the switchboard pin used by the Chesapeake & Potomac Telephone Company in its exchanges in Baltimore and Washington, D. C., is an infringement on the Watts patent. Mr. Davis is president of the Viaduct Manufacturing Company, owners of the Watts patent. The case was virtually one between the Viaduct company and the Western Electric Company, in which the Viaduct company won.

New Discoveries of Platinum.

A Paris paper states that small veins carrying platinum have recently been found in syenitic rocks in Hungary. Platinum has also been found in veins of manganese ore existing in altered or decomposed syenites near Santa Rosa de Osos, in Colombia, South America.

American Electric Telephone Company.

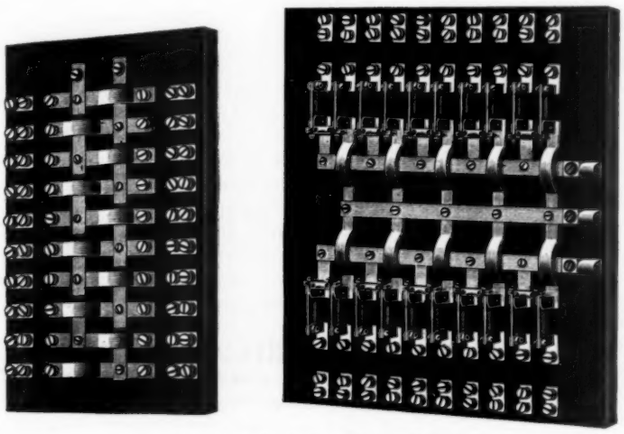
The American Electric Telephone Company, of Kokomo, Ind., has recently largely increased its factory facilities and is now in a better position than ever to turn out promptly its well known high-grade telephone apparatus.

A New and Improved Panel Board.

We illustrate on this page a new panel board, manufactured by J. Jones & Son, of New York, in which are combined good quality of workmanship, carrying capacity and neatness, with low cost. The cost is reduced to a minimum by the peculiar feature of having the branch circuits jump the main bars to the points where contacts are desired, the two surfaces, that of main and branch circuits, being held together and to the base by the same screw. Heretofore the general usage has been to raise the mains, the branches being mounted on the slate, contact with the main being made by blocks between the surfaces of the mains and branches at the points desired.

This method is costly and requires considerable exactness to make a good, neat mechanical piece of work. The mounting of this class of work also requires considerably more labor.

The contact surfaces in the Jones product are reduced to two (the minimum), therefore a reduction in resistance and, necessarily, better conductivity at these points in consequence. Copper only is used in this new panel.



J. JONES & SON'S NEW PANEL BOARD.

The switch handle is on the top and is a part of the cross-bar between the blades, being a position where it can do best service and at the same time be away from the surfaces carrying current. Heretofore this has been attempted by slanting the handles, but does not meet the requirements.

The switches are made to make best contacts, all the working parts being mechanically perfect, and the surfaces fitting with exactness.

Electric Separators in Mining.

A special from Allentown, Pa., to the Philadelphia *Ledger* says that Thomas A. Edison, with several prominent iron men, was in that city recently. He has been at Catasauqua for several days making a series of experiments at the Crane Iron Works. This company lately purchased about 1,500 tons of briquettes from the Edison mines, near Lake Hopatcong. These briquettes weigh about a pound or so, and consist of ore compressed into a circular-shaped disk.

The ore is all of a low grade, and through the agency of a magnetic separator the ore is extracted from the rock, which has been reduced to a powder. The ore is called a "concentrate," and out of 5,000 tons of ground rock the result is about 250 tons of concentrate. This concentrate contains about 60 to 65 per cent of pure ore.

This week the Crane Iron Company commenced testing the ore, and Mr. Edison, accompanied by one of his assistants, Frederick Ott, is anxiously watching the result of the tests. Should the ore be all that is claimed for it, this new method of mining will revolutionize the present method, particularly in regard to the low grades of ore found on the Lehigh Mountains. The leanest kind of ore can be worked at a profit under the Edison method.

Union Traction Company Not Sold.

President H. C. Adams, of the Union Traction Company, of Rutherford, N. J., informs the ELECTRICAL REVIEW that the recent reports to the effect that the Consolidated Traction Company, of New Jersey, had purchased his road are untrue. The Union Traction Company has not been sold to any one.

KIND WORDS.

"HIGHLY PLEASED."

TO THE EDITOR OF ELECTRICAL REVIEW:

Must say that I am highly pleased with your paper and do not care to be without it. I wish it all success in the future.

Yours very truly,

GEORGE W. CLAPP.

January 8.

New York and St. Augustine.

One thousand miles in less than 28 hours! From Winter to Summer in a day's luxurious journey! From snow to the tropical palm in a day, with the fatigue of traveling having been rendered almost impossible by the wonderful management of one of the world's most progressive railroads. It sounds like an impossibility—a leaf from a fairy tale—but that is what the Winter schedule of the Southern Railroad Company means. Leave New York at noon to day, and tomorrow afternoon, at 4.40, you step off this superb Limited Pullman Vestibuled train at St. Augustine in a garden of flowers, and within view of the most beautiful hotels on this continent. You have seen in that marvelous trip between New York and Florida 1,000 miles of panoramic scenery—swiftly shifting changes of people and climate. As long as you live, that trip, with its scenes and experience on the finest train this country has yet produced, will be indelibly impressed on your memory.

An additional Pullman Drawing-Room Sleeping Car is attached to the New York & Florida Limited, and is operated between New York and Augusta, making close connection at Trenton, within a few minutes' ride of Aiken. For further particulars, address New York office, 271 Broadway.

ADVANCE INFORMATION

Electric Light and Power.

BLUFFTON, OHIO—Special election will be held here to decide on issuing $10,000 of electric light bonds.

CORTLAND, N. Y. — Mr. John Hamlin, who for several months has been the superintendent of the Cortland & Homer Electric Light Company, is about to start a new electric light plant here.

TOWER, MINN.—Mr. Claypool, of the Tower Electric Light and Telephone Company, will put in new engine at the plant.

POTTSVILLE, PA.—G. A. Berner, Town Clerk, may give information concerning lighting the streets with electric arc lights of 2,000 candle-power each and incandescent lights of 32 candle-power each for a term of one, three or five years.

ELLIS JUNCTION, WIS.—City Clerk may be addressed concerning electric light plant to be established.

NEWARK, N. J.—The Hillsdale Light and Electric Company has applied to the South Orange Village Board of Trustees for permission to erect a plant in the village and lay wires underground.

QUINCY, MASS.—A large electric plant is to be erected at Forest Hills to furnish power for the Dedham branch of the New York, New Haven & Hartford line.

TIPPECANOE, OHIO—J. M. Haaga, City Clerk, may be addressed concerning construction of electric light plant.

SISTERSVILLE, W. VA. — Address cashier Tyler County Bank concerning construction of electric light plant by a company which is being organized.

OXFORD, N. Y.—Nightingale, Johnson & Company, of Utica, have been given the contract to put in the electric light plant and do additional work at the Woman's Relief Corps Home.

ST. LOUIS, MO.—The citizens of Webster Grove are entertaining a project for the establishment of an electric light plant to cost in the neighborhood of $20,000.

ALBANY, N. Y.—The Westchester Gas and Electric Company has filed articles of incorporation with the Secretary of State. It will furnish heat, light and power in the towns of Harrison, Larchmont, Scarsdale, Rye, Mamaroneck and New Rochelle. The capital stock is $300,000. The directors are James M. Pendleton and Albert L. Chester, of Westerly, R. I.; George V. Foster, of New York; Wallace Hackett, of Portsmouth, N. H.; Herbert T. Runings, of Mount Vernon; Paul Armitage, of Bay Shore, and Henry D. Donnelly, of Brooklyn.

WINSTON, N. C.—J. B. Temple, Mayor, may be addressed concerning proposed construction of electric light plant.

HAWKINSVILLE, GA.—J. L. Ludlow can give information concerning construction of electric light plant.

DAYTON, TENN.—Dayton electric light plant will shortly resume operations.

COLUMBUS, GA.—The Brush Electric Light and Power Company will enlarge its water-power development to about 2,000 horse-power, from 1,200 horse-power, and be enabled to furnish electric power to small industries.

HOUSTON, TEX.—B. R. Warner, City Secretary, may be addressed concerning erection of electric light plant.

New Electric Railways.

BOSTON, MASS.—A party of Massachusetts capitalists have purchased the franchise of the Kittery, Kittery Point & York Beach Electric Railroad Company, and the work of construction will be commenced at once. It is expected that work will be finished by June 1, 1897. The same parties are attempting to acquire possession of the Portsmouth Electric Railroad franchise, and to build simultaneously.

SAN BERNARDINO, CAL.—There is talk in this place of trying to equip the street car system with electricity. Unless this is done service will be abandoned.

LOS ANGELES, CAL.—The officials of the Terminal Road are entertaining a proposition to substitute electricity for steam on the Glendale branch of the road between this place and Verdugo Park.

NEW PALTZ, N. Y.—The new owners of the Highland Electric Road franchise are seriously considering the extension of the road to Roseton, and perhaps from that point to Newburgh.

BUFFALO, N. Y.—Chauncey Depew, W. K. Vanderbilt and others are interested in construction of a trolley line between Blasdell and Depew.

SHEBOYGAN, WIS.—The Electric Railway Company will make extensions to their lines in the Spring.

SYRACUSE, N. Y.—Henry C. Allen, engineer, can give information concerning construction of Onondaga Lake Electric Railway, for which contracts will soon be let.

New Manufacturing Companies.

SAN FRANCISCO, CAL.—The San Francisco Electrical Company has been incorporated. H. P. Thayer, Frank Thurber, J. B. Warren, M. L. Osler, A. E. Pryor, incorporators. Capital stock, $50,000.

COLUMBUS, OHIO—The Columbus Gas Engine Company has been incorporated. Capital stock, $7,000. Incorporators are John Keleher, William A. Pope, Lawrence J. Hickey, Charles R. Hess, John F. Fergus and James J. Walcutt. The company will manufacture and deal in gas and gasoline engines, engine governors and electrical appliances.

INDIANAPOLIS, IND.—The Advance Electric Company has been incorporated for the sale of electrical supplies. Capital stock, $5,000. The directors are Harry B. Marsh, David B. Smith and Charles H. Talmage.

INDIANAPOLIS, IND.—The Pyle Electric Headlight Company has been incorporated to manufacture electric headlights for locomotives. Capital stock, $25,000. The incorporators are Louis Hollweg, George C. Pyle and Frank H. Ewers.

ST. LOUIS, MO.—The Electric Depositing and Manufacturing Company has been incorporated. The capital stock is $5,000. Charles H. Huntley, Charles F. Haus, H. Lefavore, John Hocklinborg and Robert Taylor, incorporators.

SPRINGFIELD, OHIO—J. D. Hurd and others will organize a company with a capital stock of $25,000, to manufacture an electric fan.

New Telephone and Telegraph Companies.

CEDAR RAPIDS, IOWA—Officers of the Iowa Telephone Company here have positive assurances that early next Spring the long-distance telephone in operation between Chicago, New York and other eastern points will be extended here and to all principal points in Iowa and to Omaha. A line will also be built from here to Minneapolis.

Business Troubles.

COVINGTON, OHIO—The Covington Electric Light Company has gone into the hands of a receiver. Ex-county treasurer J. C. Ullery has been appointed.

Increase of Capital.

SPRINGFIELD, MASS.—The Springfield Lighting Company has increased its capital stock from $125,000 to $160,000.

AGENTS WANTED.

We desire live agents in every town (except in the State of New York), to handle our new Lamp. Send us $1.80 and we will send you sample with instructions, or you can send $1 80 to any express company here and they will send you the lamp.

We offer you a splendid chance for making money.

PACIFIC ELECTRIC COMPANY,
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WHITE-CROSBY COMPANY,
CONTRACTING ENGINEERS,
EQUITABLE BUILDING, BALTIMORE, MD.

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CONNECTORS AND TERMINALS.
Special Connectors for HARD-DRAWN COPPER WIRE, *All Sizes.*
Fused Wire, Fused Links and Strips.
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THREE GREAT TRAINS.
"KNICKERBOCKER SPECIAL"
Between ST. LOUIS, INDIANAPOLIS, CLEVELAND, NEW YORK and BOSTON.
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is but a small percentage on the returns it yields and the saving it effects in the conduct of a business.
Any telephone subscriber who has had moderate experience in the use of the service will confirm this statement and furnish examples.
17,000 Telephone Stations in New York.
Minimum Rate, Direct One Line, 600 Local Messages $90 a year
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ST. LOUIS, American Central Building.
CHARLOTTE, N. C., 36-38 College St.
SYRACUSE, N. Y., Bastable Building.
SAN FRANCISCO, Mills Building.
WASHINGTON, D. C., 1333 F St., N. W.

ALLEGHENY, PA., Robinson Street.

Kindred.... ...Interests

The Metropolitan Electric Company, of Chicago, report heavy sales of interior conduit material, of which they carry a heavy line in stock.

The monthly calendar of the Joseph Dixon Crucible Company for January contains Happy New Year greetings, bearing a picture illustrating a rack made out of the famous Dixon pencils, as well as an appropriate quotation from Longfellow.

Huebel & Manger, 286 to 290 Graham street, Brooklyn, N. Y., manufacturers of electrical and brass goods, have brought out a combination pin-cushion, thimble and spool-holder, and an ash-receiver to be attached to a card table. Both these novelties are meeting with success.

The recent action of the insurance companies in requiring practically the same regulations for wiring in the smaller towns as is required in the large cities, has resulted, reports the Metropolitan Electric Company, of Chicago, in a large increase of orders for rubber-covered wire, porcelain tubes and porcelain-covered cut-outs.

The Electric Appliance Company, of Chicago, look back on the Christmas season just passed as a particularly satisfactory one, not only for the reason that it represents the beginning of their sixth business year, but also on account of the very satisfactory way in which the orders came in during the month of December, at which time they report that business seemed to take quite a jump.

The following is a list of machinery shipped by the American Engine Company, Bound Brook, N. J., during the month of December, 1896:

One 60-horse-power American-Ball engine to the Scranton *Truth;* one 50 and one 12-horse-power motor to the Western Newspaper Union; one 100-light dynamo to the Chattanooga *Daily News;* one 60-horse-power American-Ball engine to the Albany *Journal;* one 5-horse-power motor to the Gazette Publishing Company; one 12-horse-power motor to the Toledo *Blade;* one 12-horse-power motor to the W. D. Boyce Company; one 9-kilowatt dynamo to the Age-Herald Publishing Company; one 9-kilowatt dynamo to the Dayton *Journal;* one 3-horse-power motor to the Indianapolis *Sun;* one 75-kilowatt dynamo to the Inquirer Company; one 3-horse-power motor to the Harrisburg *Telegram;* one 9-kilowatt dynamo to the Jarecki Manufacturing Company; one 100-horse-power motor to the Boston *Herald.*

Up to date the car-heating business of the American Electric Heating Corporation, Boston, has been surprisingly large, everything considered. Contrary to their expectations, it was not affected by the general depression as much as they believed it would be, and since the election orders have been quite numerous and liberal. Among the more important ones received during the past 60 days can be mentioned orders from the North Chicago Street Railway, Metropolitan Street Railway, Chicago; Braintree & Weymouth, Braintree, Mass.; Lynn & Boston; City-Railway, of Dayton, Ohio; Fair Haven & Westville, of New Haven, Ct.; Public Works Company, of Bangor, Me.; Quincy & Boston; additional heaters to the West End Street Railway; Manchester Street Railway Company, Manchester, N. H.; Roxborough, Chestnut Hill & Norristown, and Midland Road, of Staten Island, N. Y.

The Gates Iron Works, of Chicago, announce their embarkment in the high-speed engine business with the Fischer-Gates single and four-valve self-oiling automatic engines, built according to the design and under the patents of Mr. Fred F. Fischer. Their product in this line will be handled on the market by Messrs. Fischer & Whiteside, whose headquarters are at 700-702 Fischer Building, Chicago. Plans for extensive additions to the already very large plant of the Gates Iron Works are completed, and it is intended to push this branch of their business with the energy, experience and business tact characteristic of this company. The catalogue illustrating and describing the novel features of the Fischer-Gates engine, many of which are already familiar to the engineering fraternity, will be ready for distribution in a short time. Orders for these engines are already on their books. The reputation of this concern and that of the gentlemen who are associated with them will insure a high-class machine and the most cordial and conservative treatment of their patrons.

The People's Electric Light and Power Company, of Newark, N. J., burned out on Tuesday night, December 29. Charles A. Schieren & Company, of 45 Ferry street, New York city, received an order Wednesday, December 30, at noon, for 118 feet of 72-inch, three-ply leather belting, to be put on at the station of the light company, in complete running order, at four o'clock on December 31. By working several gangs of men all night, Schieren & Company were able to do the job in 28 hours after receipt of order, which is said to be the quickest time on record for an order of this magnitude. They have also just received an order for 116 feet of 72-inch, three-ply leather belting from the Brooklyn Heights Railroad Company, of Brooklyn, N. Y. They are now also working on an order for 126½ feet of 72-inch, three-ply leather belting for the North River Electric Light Company, of New York city.

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20-K. W. 110-Volt DYNAMO, good as new, and in perfect order.

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ISSUED JANUARY 5, 1897.

574,370 Manufacture of incandescent electric lamps; T. B. Atterbury, Pittsburgh, Pa.—The method of making incandescent lamps consisting in cementing an unground perforated stopper in the lamp by vitrifiable enamel or cement, and then heating to vitrify said enamel.

574,388 Electric propulsion of vehicles; W. A Butler, New York, N. Y.

574,417 Secondary battery and process of forming same; G. W. Harris, New York, N. Y.

574,536 Electrically heated sad-iron; W. S. Hadaway, Jr., New York, N. Y.—A sad-iron having a smooth surface, bounded by two side lines and a base line, said surface, in outline, having the form of a triangle, combined with an electric heating conductor in proximity thereto, but insulated therefrom, said conductor being helically disposed in two or more continuous sections, each section composed of a series of convolutions, the convolutions of the section located at or near the base line being greater than the convolutions at or near the side lines, whereby the greater heating capacity is located along said base line.

574,537 Automatically controlled electric oven; W. S. Hadaway, New York.

574,579 Circuit for annunciators of telephone lines; C. E. Scribner, Chicago, Ill.—A telephone line equipped at its sub-station with a generator of signaling current, and at its central station, including a spring-jack switch and the magnet of an annunciator adapted to display its indicator when traversed by current, a local circuit including the winding of the annunciator or a portion thereof, and separable contracts of the spring-jack, together with a source of current, and switch contacts controlling said local circuit adapted to be closed together when the armature of the annunciator is attracted.

574,632 Electric railway; W. M. Schlesinger, Philadelphia, Pa.—A line of railway rails electrically connected to form a working conductor, another conductor separate from the track rails, and an electrically propelled car having separate traveling collectors between its motor and said conductors, one of the collectors for the rail conductor being normally out of contact, and adapted to be manually placed in contact with said rail.

574,642 Telephone switchboard; H. J. Swart, Knoxville, Tenn.—Consists of a series of vertically disposed annunciator boards, arranged around a common center, subscribers' line plugs, arranged in series corresponding with the annunciators of each board, between said board and the said center, and provision whereby the operator can be stationed at the said center.

574,654 Telephone receiver; R. S. Barnum, Chicago, Ill.

574,669 Electric clock; C. M. Crook, Chicago, Ill.—A chronometer having second-hand rotating about a different center from the minute-hand, with the principal train, a train connecting the three hands, said train having frictional connection only with the principal train, such connection being at a wheel in said train intermediate between the minute and second hands.

574,707 Automatic telephone exchange system; Lawrence G. Bowman, Fort Wayne, Ind.—An automatic telephone exchange system, comprising a plurality of subscribers' lines and a central office, having a revoluble drum for each of said lines, said drums being provided each with peripheral contact plates, corresponding in number to the subscribers' lines, connections between the subscribers' lines and their respective contact plates on the drum, and a second connection from each subscriber's line to its respective drum, and means for moving said connection relative to the drum to engage the contact plates thereof successively, and cut its line into circuit with a second line.

574,739 Electrical measuring and indicating apparatus; J. F. Kelly, Pittsfield, Mass.—Consists of a vibrating needle and stationary quadrants, separated from each other by a wall of insulating material.

574,745 Electric heater; John E. Meek, New York, N. Y.

574,828 Insulator; B. D. B. Smock, Wickatunk, N. J.—An insulator consisting of a body portion with an opening to receive a wire, and a ribbed wedge adapted to be inserted to hold the wire therein.

574,856 Electric alarm device; G. V. Trott, Chicago, Ill.

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